

## **Annotated Field Sample Plan**

*This annotated field sample plan (FSP) was prepared to assist in the preparation of FSPs for field sampling events sponsored by the Site Evaluation and Grants Section, U.S. Environmental Protection Agency (EPA) Region IX. It was prepared using the guidance document Preparation of a U.S. EPA Region IX Sample Plan for EPA-Lead Superfund Projects (Quality Assurance Management Section, U.S. EPA, Region IX, August, 1993) and FSPs for previous sampling events sponsored by the Site Evaluation and Grants Section, EPA Region IX. Although this annotated FSP attempts to cover several common types of surface and subsurface soil, surface water sediment, surface water, and groundwater sampling; exceptions to the procedures contained herein will occur and generic sections might have to be modified or new sections written. For ease in developing an actual FSP from this annotated FSP, an electronic template has also been developed. Directions for preparation are given in italics, examples or template language is provided in plain text.*

*Additional methods and procedures are included as Attachment A. This attachment contains generic procedures for collecting surface water samples, conducting well inspections, developing wells, conducting slug tests, sampling groundwater springs, and surveying onsite wells. If one of these field procedures is appropriate for the site investigation, it should be incorporated in Section 5.0 of the FSP in the appropriate location with any necessary site-specific modifications. Subsections should then be renumbered accordingly.*

**U.S. Environmental Protection Agency Region IX  
Hazardous Waste Management Division  
Field Operations Branch**

**Annotated Field Sample Plan**

Prepared by:  
**Bechtel Environmental, Inc.**  
P.O. Box 193965  
45 Fremont Street  
San Francisco, CA 94119

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**EPA Work Assignment Manager: Philip Armstrong**

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## 1.0 OBJECTIVES OF SAMPLING EFFORT

Section 1.0 addresses the objectives of the sampling proposal. This section should discuss the name of the agency/contractor doing the sampling, the purpose of the sampling event, the general analytical information needed for the site, and how the data will be used. It should also include the protocols upon which the plan is based.

\_\_\_\_\_ [Name of agency/contractor] will conduct this field sampling effort to gather data as part of a \_\_\_\_\_ [Type of investigation and investigation abbreviation; i.e., site inspection (SI), expanded site inspection (ESI), integrated assessment (IA)] under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund). The \_\_\_\_\_ [Type of investigation; i.e., SI, ESI, IA] builds upon the body of information developed during the Preliminary Assessment (PA) [and, if applicable, also include names of other EPA investigations; i.e., “and site inspection (SI)”] by verifying and substantiating data collected during the PA [and, if applicable, also include names of other EPA investigations; i.e., “and SI”], collecting additional data through a site reconnaissance visit, and collecting physical environmental samples to analyze for the presence of hazardous substances.

Field sampling will be conducted under protocol accepted by the U.S. Environmental Protection Agency (EPA) as specified in the *Preparation of a U.S. EPA Region IX Sample Plan for EPA-Lead Superfund Projects* guidance document (Quality Assurance Management Section, U.S. EPA, Region IX, August, 1993) and the programmatic *Quality Assurance Project Plan, Revision \_\_\_\_\_* [Revision Number] (QAPjP) submitted by \_\_\_\_\_ [Name of agency/contractor] on \_\_\_\_\_ [QAPjP submittal date] and approved by the EPA on \_\_\_\_\_ [QAPjP approval date]. Laboratories participating in the EPA Contract Laboratory Program (CLP) will be utilized for analyses. Laboratory services will be obtained and coordinated through the EPA Quality Assurance Management Section (QAMS).

The site being investigated is the \_\_\_\_\_ [Site name, followed by an abbreviated version of the site name, if appropriate, in parentheses\*] site (\_\_\_\_\_ [EPA ID Number]) in \_\_\_\_\_ [City], \_\_\_\_\_ [County] County, \_\_\_\_\_ [State]. [After introducing the site with the previous sentence, provide one or two sentences describing general site operations, hazardous substances on site, and period(s) of site operation/hazardous substance deposition. Then include a sentence describing the medium or media potentially impacted by these hazardous substances] The objective of \_\_\_\_\_ [agency/consultant name]’s sampling effort is to determine the presence and measure the concentrations of contaminants in \_\_\_\_\_ [describe what is to be sampled; e.g., onsite soils, groundwater hydraulically downgradient of the site, surface water sediments downstream of the site]. In addition, \_\_\_\_\_ [describe sampling for background concentrations; e.g., representative soil undisturbed by site activities, hydraulically upgradient groundwater, surface water sediments upstream of the site] will be sampled to establish background concentrations. These data will be used to support decision-making efforts by the EPA as part of the \_\_\_\_\_ [Type of investigation; i.e., SI, ESI, IA] process. [If this is an IA, add this sentence: “Data gathered during this investigation will be also used by the EPA to determine the most appropriate removal or remedial action for the \_\_\_\_\_ [type of contamination; i.e., subsurface soil] contamination at the site.”]

### EXAMPLE:

**The site being investigated is the Chromium and Cadmium Plating, Inc. (Chromium Plating) site (CAD 123456789) in Stockton, San Joaquin County, California. A metal plating operation has occupied the site since 1965. The DTSC received complaints of spent metal-plating solution being dumped onto onsite soils and, during a March 1982 inspection, DTSC staff noted “chemical spillage” in the eastern portion of the site. (1,2,3) The objective of BEI’s sampling effort is to determine the presence and measure the concentrations of contaminants in onsite soils and groundwater hydraulically downgradient of the site. In addition, representative soil undisturbed by site activities and hydraulically upgradient groundwater will be sampled to establish background concentrations. These data will be used to support decision-making efforts by the EPA as part of the SI process.**

**\* NOTE: If the site name is long, decide on an abbreviated name at the beginning of the FSP. Put the abbreviation in parentheses after the full site name in the third paragraph, as indicated above. For the rest of the report, use only the abbreviated name, not the full name. When referring to the site, always include the word site, because, under CERCLA, this is the entity that is being evaluated for the EPA. Remember, the HRS defines a site as the hazardous substance sources and the area between these sources. We are not evaluating the building(s) or the company. You may refer to the site as “the \_\_\_\_\_ [Site Name or Abbreviated Site Name] site” or just “the site.” If describing something that is relevant to the company only (e.g., the \_\_\_\_\_ is owned by Harry Smith or the \_\_\_\_\_’s headquarters are in Chicago), use the abbreviated name alone rather than the word site.**

## 2.0 BACKGROUND

This section provides an overview of the site. The section should describe the site's location; operational history; previous investigations at the site; the involvement of federal, state, and local regulatory agencies; and the apparent problem(s) associated with the site. It should include at least two maps: one showing the general site location and one showing the site layout with significant site features. Additional maps showing sampling locations and/or analytical results from *previous sampling events can also be included.*

### 2.1 Location

The \_\_\_\_\_ [Site Name or Abbreviated Site name, if one was designated in Section 1.0] site is located at \_\_\_\_\_ [Street Address] in \_\_\_\_\_ [City], \_\_\_\_\_ [State]. The geographic coordinates of the site are \_\_\_\_° \_\_\_\_' \_\_\_\_" N latitude and \_\_\_\_° \_\_\_\_' \_\_\_\_" W longitude (Township \_\_\_\_\_, Range \_\_\_\_\_, Section \_\_\_\_\_, \_\_\_\_\_ Baseline and Meridian, \_\_\_\_\_, 7.5-minute quadrangle). The location of the site is shown in Figure 2-1.

**Figure 2-1 Site Location** (Not included)

### 2.2 Site Description

The site occupies \_\_\_\_\_ [acres or square feet] in a \_\_\_\_\_ [urban, commercial, industrial, residential, agricultural, or rural] area. The site is bordered on the north by \_\_\_\_\_, on the west by \_\_\_\_\_, on the south by \_\_\_\_\_, and on the east by \_\_\_\_\_.

The second paragraph (or set of paragraphs) should describe historic and current onsite structures. This description *should be consistent with what is presented in Figure 2-2, Site Layout (not included).*

EXAMPLE:

The site currently consists of an office building, a processing plant, an outdoor drum storage area, and a paved parking lot. From 1965 to 1975, an additional building was on site in the area that is currently occupied by the paved parking lot. This building was used for equipment storage.  
The site layout is shown in Figure 2-2. (Not included)

### 2.3 Operational History

The first paragraph (or set of paragraphs) should discuss readily available information on who has owned and operated the site. Present this information chronologically. If owner/operator information is unknown for any time period, state *this.*

EXAMPLES:

**1) The site was undeveloped before 1965. Since 1965, the site has been occupied by a metal plating operation that was originally owned by Chromium Plating, Inc. In 1988, Chromium Plating, Inc. was bought by Cadmium Plating. [Please note that the full name of the second company is Cadmium Plating, Inc. However, if you designated an abbreviation for this name in Section 1.0 (e.g., Cadmium Plating), be consistent and use the abbreviation throughout the FSP.]**

**2) Information regarding activities at the site before 1965 was not available at the time of the SI. Since 1965, the site has been occupied by a metal plating operation that was originally owned by Chromium Plating, Inc. In 1988, Chromium Plating, Inc. was bought by Cadmium Plating.**

**The second paragraph (or set of paragraphs) should describe past and current operations. Be sure to describe the processes and the hazardous substances used in the processes.**

**The third paragraph (or set of paragraphs) should describe past and present waste management practices. Were/are**

**hazardous wastes generated by one or more of the processes described in the second paragraph? If so, what were/are they, how and where were/are they stored on site, and where were/are they ultimately disposed of?**

#### **Figure 2-2 Site Layout (Not included)**

The fourth paragraph (or set of paragraphs) should describe any sampling that the owner/operators have conducted at the site. Be brief, because the sampling event(s) will be discussed again in Section 2.4 (Previous Investigations) and in Section 2.5 (Regulatory Involvement), *if there was public agency oversight*.

## **2.4 Previous Investigations**

This section should briefly discuss all previous sampling efforts relevant to the site. In it, you need to provide the sampling date(s); name of the party who conducted the sampling; for whom the sampling was conducted; the rationale for sampling; the media sampled (e.g., soil, sludge, groundwater, surface water, sediments, or air); number of samples that were collected; sample locations and depths, if appropriate; laboratory methods that were used to analyze the samples; a brief summary of the sampling results; and a brief discussion on data quality and usability. Please note that you should summarize the full scope of each sampling effort here.

Sampling should be presented in subsections according to the media that were sampled (e.g., 2.4.1 Soil Sampling). The subsections dealing with media that were sampled to characterize hazardous substance sources at the site should be presented first (e.g., soil sampling, soil gas sampling, drum sampling, and sludge sampling), followed by subsections dealing with media that coincide with the HRS migration pathways (i.e., groundwater sampling, surface water sampling, and air sampling).

If a previous sampling event was conducted under EPA auspices, prior to July 1994, it should be noted that compounds and inorganic analytes included in CLP Routine Analytical Services (RAS) methods are on the CLP Target Compound List (for organics) and on the CLP Target Analyte List (for inorganics). For analytical requests for Special Analytical Services (SAS), the text should refer to the analytical method by its EPA method name and number. For example: “The samples were analyzed for organochlorine pesticides by EPA Method 8140.”

If a previous sampling event was conducted under EPA auspices after July 1994, it should be noted that compounds and inorganic analytes included in Contract Laboratory Program Analytical Services (CLPAS) methods are on the CLP Target Compound List (for organics) and on the CLP Target Analyte List (for organics). For analytical requests for the Regional Analytical Program (RAP), the text should refer to the analytical method by its EPA method name and number. For example: “The samples were analyzed for organochlorine pesticides by EPA Method 8140.”

When presenting previous sampling results, use the units that are reported in the laboratory’s or consultant’s reports (i.e., µg/l, mg/l, µg/kg, mg/kg, ppm, or ppb). Do not convert the results to the same units. The only exception to this rule is when sampling results are being directly compared in the same sentence or paragraph. In this case, units should be converted to mg/l or µg/l for water samples and mg/kg or µg/kg for soil samples.

### **EXAMPLE:**

**2.4.1 Soil Sampling.** In April 1990, the site owner conducted a post-removal sampling effort, under the direction of the California Environmental Protection Agency, Regional Water Quality Control Board (RWQCB), North Coast Region (formerly known as the California Regional Water Quality Control Board), to confirm that the underground waste solvent storage tank had not leaked during the period of time that it was on site. Twenty soil samples were collected from 10 locations and two depths (0 inches to 6 inches and 2 feet to 3 feet below ground surface) in the excavated area where the tank had been located. The samples were analyzed for volatile organic compounds (VOCs) using EPA Method 601. No analytes were detected. The analytical data appear to be of sufficient quality for use at the SI stage.

In September 1991, as part of a property transfer transaction, the site owner collected 10 soil samples from five locations and two depths (4 feet and 8 feet below ground surface) in the northwest corner of the site. A buried surface impoundment that was used for the disposal of spent metal plating solutions from 1960 to 1980 is located in this area of the site. Background samples were also collected from three offsite locations, at the same two depths. The samples were analyzed for metals using EPA Method 6010. Chromium was detected in all 10 onsite samples at

**concentrations ranging from 100 mg/kg to 250 mg/kg. Cadmium was also detected in all 10 onsite samples at concentrations ranging from 50 mg/kg to 75 mg/kg. Chromium and cadmium were detected in the background offsite samples at concentrations ranging from 7 mg/kg to 10 mg/kg and 3 mg/kg to 5 mg/kg, respectively. The analytical data appear to be of sufficient quality for use at the SI stage.**

*2.4.2 Groundwater Sampling.* On September 8, 1992, BEI, under the direction of EPA, conducted a sampling event at the site. Groundwater samples were collected from four private drinking water wells in the vicinity of the site. All samples were analyzed using Contract Laboratory Program (CLP) Routine Analytical Services (RAS) for inorganics (RAS inorganics). The RAS inorganics method analyzes for analytes included on the CLP Inorganic Target Analyte List (TAL). Analytical data were validated by the EPA Quality Assurance Management Section (QAMS). The results indicate the presence of 3.5 mg/l to 5 mg/l chromium and 3.3 mg/l to 4 mg/l cadmium in the two hydraulically upgradient background wells, and 123.7 mg/l to 150 mg/l chromium and 33.6 mg/l to 40 mg/l cadmium in the two hydraulically downgradient wells. The analytical data appear to be of sufficient quality for use

**at the SI stage.**

Please note that these sampling events will be discussed again briefly in subsection 3.1 (Waste Characteristics) and, possibly, subsection 3.2 (HRS Pathways). Subsection 3.1 describes the hazardous substance sources on site while subsection 3.2 summarizes the contamination actually or potentially associated with each pathway to be sampled during *the SI sampling event*.

## **2.5 Regulatory Involvement**

Present the agencies in the following order: federal, state, and then local.

### **2.5.1 Agency 1.**

Agency 1 is almost always the EPA [**U.S. Environmental Protection Agency (EPA)**]. The first paragraph in this section discusses the CERCLA and RCRA status of the site.

**2.5.1 U.S. Environmental Protection Agency (EPA).** The \_\_\_\_\_[Site Name] site was entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database on \_\_\_\_\_[CERCLA Discovery Date]. The site is [is not] listed in the Resource Conservation and Recovery Information System (RCRIS) database, as of \_\_\_\_\_[date of database printout], as a \_\_\_\_\_ [large quantity or small quantity] hazardous waste generator.

If the EPA has sponsored a sampling event at the site, briefly note this in a second paragraph. Remember, any previous EPA-sponsored sampling is discussed in greater detail in Section 2.4. If the EPA has not sponsored previous sampling at the site, omit the second paragraph.

### **2.5.2 Agency 2.**

Agency 2 is almost always a state agency. Discuss any DTSC involvement with the site. No matter how extensive a state agency's activities may be at the site, do not refer to the agency as the "lead" agency. To the EPA, the term "lead" means that the EPA has officially designated an agency as the authority responsible for overseeing assessment, characterization, and remediation of the site. If that were actually the case, you would not be conducting a CERCLA sampling event at the site.

For sites in California, Section 2.5.2 will usually have the following heading and subheadings:

### **2.5.2 California Environmental Protection Agency.**

The name "California Environmental Protection Agency" came into being as the result of a 1991 reorganization of the State of California's various environmental departments. The two entities within this new agency that you will be dealing with the most are the Department of Toxic Substances Control (DTSC) and the Regional Water Quality Control Board (RWQCB).



## **Department of Toxic Substances Control (DTSC).**

Before the aforementioned 1991 reorganization, the name of the DTSC was the “California Department of Health Services, Toxic Substances Control Division.” Therefore, if your first mention of the DTSC is for activities that occurred before the reorganization, the reference to the DTSC should be as follows: “The California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) (formerly known as the Department of Health Services, Toxic Substances Control Division)”. If your first mention of the DTSC is for activities that occurred after the reorganization, you may first reference the agency as “The California Environmental Protection Agency, Department of Toxic Substances Control (DTSC).”

## **Regional Water Quality Control Board (RWQCB).**

Before the aforementioned 1991 reorganization, the name of RWQCB was the “California Regional Water Quality Control Board, \_\_\_\_\_ Region.” Therefore, if your first mention of the RWQCB is for activities that occurred before the reorganization, the reference to the RWQCB should be as follows: “The California Environmental Protection Agency, Regional Water Quality Control Board, \_\_\_\_\_ Region (RWQCB) (formerly known as the California Regional Water Quality Control Board, \_\_\_\_\_ Region)”. If your first mention of the RWQCB is for activities that occurred after the reorganization, you may first reference the agency as “The California Environmental Protection Agency, Regional Water Quality Control Board, \_\_\_\_\_ Region (RWQCB).”

### **2.5.3 Agency 3.**

Agency 3 is usually a local agency, such as a county environmental department and/or a city fire department. Insert *additional subsections to accommodate additional agencies.*

## **2.6 Apparent Problem**

This section should provide the reader with an idea of how the site came to someone’s attention (not necessarily the EPA’s). Discuss things such as citizens’ complaints, public agency inspections during which leaking drums were observed, and drinking water wells that were closed because of contamination that may be attributable to your site. Sampling results are usually not appropriate for this section. Remember to be objective and to use bullets for this section *if possible.*

The apparent problems at the site are:

### **EXAMPLE:**

**The apparent problems at the site are:**

- **The DTSC and the San Joaquin County Public Health Department conducted a joint inspection of the site in May 1982, in response to an anonymous telephone call regarding the discharge of sulfuric and hydrochloric acids onto onsite soil. Before this telephone call, the DTSC had received numerous other complaints of illegal dumping of unknown chemicals onto soil at the site. During the May 1982 inspection, “chemical spillage” was observed on soil in the eastern portion of the site. (4)**

- **During a December 1987 DTSC Abandoned Site Program drive-by, 55-gallon drums in poor condition were observed and photographed in the eastern portion of the site (5).**

- In May 1990, the City of Stockton Municipal Utilities Department, Regional Wastewater Control Facility, inspected the site and observed degraded cement around the floor drain in the area of the onsite building where acid solutions are used to prepare metal parts for plating (6).

## **3.0 HAZARD RANKING SYSTEM (HRS) FACTORS**

The HRS is a scoring system used to assess the relative threat associated with actual or potential releases of hazardous

substances from sites. It is the principle mechanism EPA uses to place sites on the National Priorities List (NPL). The quality of the data obtained from sampling and analysis at a site must be sufficient to meet the criteria for usage in the HRS, in accordance with the data quality objectives (DQO) documented in the *Guidance for Data Usability in Site Assessment*, Interim Final, January 1993, U.S. EPA Office of Emergency and Remedial Response.

### 3.1 Waste Characteristics

In Subsection 3.1, briefly describe the type and quantity of onsite hazardous substance sources (e.g. an unknown quantity of soil potentially contaminated with cadmium and chromium). If waste or soil samples are going to be collected during this event to document the presence of hazardous substances in a source, state this for that source. Likewise, if a source will not be sampled state this and the reason for not sampling. Remember to be objective. In addition, if an offsite source exists capable of impacting the sampling event, give a brief description of the source and a discussion on how it may affect the analytical data from the sampling event. If no known offsite source exists state this. No additional effort should be expended to investigate offsite sources, unless specifically requested by EPA.

#### EXAMPLE:

**Based on previous investigations, the two hazardous substance sources currently on site are the buried surface impoundment and the contaminated soils associated with this impoundment. According to company representatives, the buried surface impoundment occupies approximately 800 square feet and was used for the disposal of spent metal plating solutions, which occurred from 1960 to 1980. Results of the September 1991 sampling effort indicate that chromium and cadmium are present in the soils associated with the surface impoundment at concentrations at least three times background levels. The surface impoundment and associated contaminated soil will not be sampled during the SI sampling event since adequate data exist to characterize these**

**sources for HRS scoring purposes. Based on a review of readily available information, there do not appear to be any offsite sources capable of influencing either the rationale for sampling or the analytical data.**

### 3.2 HRS Pathways

Create a bullet for each HRS pathway that will be sampled during this sampling event. In each bullet provide a sentence or two describing the environmental setting associated with the pathway, a sentence describing the hazardous substances actually or potentially associated with the pathway, and a sentence describing pathway targets.

For the groundwater migration pathway, the environmental setting sentence(s) should describe the depth to groundwater beneath the site, the water-bearing geologic units(s) under the site that contain wells to be sampled, the depth(s) to these units(s), the direction of groundwater flow in the sampled units(s), geologic materials in the unsaturated (and possibly saturated) zones between the ground surface and the top of the uppermost sampled unit. For the surface water migration pathway, these sentence(s) should describe the 15-mile in-water segment, including how surface runoff from the site would get to the surface water body. For the soil exposure pathway, these sentence(s) should describe the surface covering (e.g., pavement or exposed soil) and fencing. For the air migration pathway, these sentence(s) should describe the site setting (e.g., industrial area), surface covering (e.g., pavement or exposed soil), and the prevailing wind direction(s) at the site.

Based on the SI investigation [or name of other investigation if not the SI investigation], the following medium/media might have been impacted by a release from the \_\_\_\_\_[Site Name] site:

#### EXAMPLE:

**Based on the SI investigation, the following media might have been impacted by a hazardous substance release from the Chromium Plating site:**

• **Onsite shallow soils (within 2 feet of ground surface). Although pavement and buildings cover much of the site, exposed soil exists in the northern portion of the site. Shallow soils might contain hazardous substances including metals, volatile organic compounds, and pesticides. There are 10 onsite residents within 200 feet of potentially**

contaminated soil. The site is in a residential area and is unfenced.

• **Groundwater in the Blue Aquifer.** Under the site, the Blue Aquifer is first encountered at 100 feet bgs. Geologic materials between ground surface and the top of the aquifer consist predominantly of clays and silts. Groundwater is first encountered at a depth of 50 feet below ground surface (bgs) and flows to the southwest in the Blue Aquifer. Groundwater in the Blue Aquifer might contain hazardous substances from the site including metals, volatile organic compounds, and pesticides. There is a domestic drinking water well approximately 500 feet hydraulically downgradient of the site and groundwater withdrawn from 24 wells within 4 miles of the site provides drinking water for approximately 34,000 people.

If particular HRS scoring scenarios or contaminants of concern have been identified prior to this sampling event, the contaminants of concern and appropriate action levels (i.e., preliminary remediation goals, HRS benchmark levels, 3 times background, etc.) should be included and discussed for each pathway sampled in a separate paragraph. In addition, how these data will be used (i.e., to define source areas, establish a release, etc.) should be also be included. However, since the FSPs can be reviewed by the public, only limited amounts of HRS language and scoring information *should be included*.

#### **EXAMPLE:**

Analytical results of a 1986 sampling event indicate the presence of arsenic, tetrachloroethene, and pentachlorophenol in municipal supply well A-1 at levels up to 60 µg/l, 4 µg/l, and 2 µg/l, respectively. However, the quality of the data does not meet HRS acceptance criteria. The maximum contaminant levels (MCL) for arsenic, tetrachloroethene, and pentachlorophenol in groundwater are 50 µg/l, 5 µg/l, and 1 µg/l, respectively. An HRS score of 328.5 is contingent on detecting arsenic, tetrachloroethene, or pentachlorophenol at concentrations above their respective MCLs.

### **3.3 Sampling Recommendations**

A separate subsection should be included for each matrix to be sampled. The subsection for each sampled matrix should discuss sampling locations, the rationale for choosing each location, the analytical methods to be used to analyze samples from each matrix, and the rationale for choosing each analytical method. Background sampling locations, together with the rationale for selecting them, should also be included for each matrix. If a random approach, systematic approach (e.g., a sampling grid), or a combination of these approaches was used to select sampling locations in a matrix, a description of the approach should be included. If potential matrix sampling points (e.g., specific wells) are excluded, explain why. Map(s) showing sampling locations in each matrix should be included with this section.

General formats for the soil, surface water, sediment, and groundwater matrices are provided below. They should be *modified as necessary to reflect conditions specific to an individual sampling event, or deleted if not necessary*.

#### **3.3.1 Soil Sampling.**

Include sub-subsection 3.3.1 if soils are to be sampled. Otherwise delete and renumber the remaining sub-subsections accordingly.

The first paragraph should provide a general soil sampling overview including the number of sampling locations and *general sample depths*.

#### **EXAMPLE:**

**3.3.1 Soil Sampling.** As shown in Figure 3-1 (not included), sampling of surface soil will be conducted at 28 locations. One surface soil sample will be collected between ground surface and 1 foot below ground surface (bgs) at each location. In addition, subsurface soil samples will be collected at 22 locations to determine the vertical extent of contamination.

The second paragraph should describe the analytical methods that will be used to analyze soil samples and the rationale

*for choosing each method.*

**EXAMPLE:**

All soil samples will be analyzed using the EPA Contract Laboratory Program (CLP) for Contract Laboratory Program Analytical Services (CLPAS) metals, CLPAS volatile organic compounds, and CLPAS pesticides/PCBs. In addition, all soil samples will be analyzed using the CLP Regional Analytical Program (RAP) for organophosphorus pesticides by EPA Method 8141. There has been a metal plating operation on site since 1965 with metal plating solution and organic solvents discharged to the ground surface. Additionally, several types of pesticides were reportedly stored onsite and a regional water quality study in 1986 and 1987 indicated the presence of several pesticides including malathion, ethyl parathion, methyl parathion, endosulfan, and diazinon in shallow groundwater near the site. The RAP method was chosen because the CLPAS pesticides/PCBs target compound list does not include all of the pesticides previously detected in the area.

*If a specific methodology is used to select sample numbers, a third paragraph explaining the methodology should be included:*

**EXAMPLE:**

The suffix of a soil sample number indicates the depth in feet from which the sample was collected. For example, sample number SS-1-1 designates a surface soil sample collected from sample location SS-1 at a depth of 1 foot bgs, sample number SS-1-2 designates a soil sample collected from sample location SS-1 at a depth of 2 feet bgs, and sample number SS-1-8 designates a soil sample collected from sample location SS-1 at a depth of 8 feet bgs.

*Finally, the rationale for choosing each soil sampling location or group of locations (including background locations) should be included. Bullet format is optional. If exact locations will be set in the field, a sentence mentioning this is included with the rationale.*

**EXAMPLE:**

The following rationales were used to determine the sample locations:

**Example bullet for background sampling locations:**

- Surface and subsurface soil samples will be collected at locations SS-1 and SS-2 and will be designated as background samples. Background samples are intended to be representative of conditions that existed in the site vicinity before site operations. Background samples will be taken in similar geological strata to the other sample locations and at similar depths. Sample locations SS-1 and SS-2 are on undeveloped land off site and appear to be representative of conditions that existed at the site prior to the disposal of potentially hazardous substances on site from 1946 to 1968. In addition, surface water runoff at the site appears to flow south, away from sample locations SS-1 and SS-2. Sample location SS-1 is adjacent to the northwest corner of the site along a strip of undeveloped land between the site and a nearby agricultural field. Sample location SS-2 is on undeveloped land adjacent to the northeastern corner of the site. Subsurface soil samples will be collected at depths of 2 feet bgs and 8 feet bgs to correspond with the other subsurface soil samples.

*Example bullet for sampling locations not selected by a random or systematic approach:*

- Surface soil or surface and subsurface soil samples will be collected at sample locations SS-3 through SS-11 to determine the presence and concentrations of metals, volatile organic compounds, and pesticides in soils in devegetated areas in the west central part of the site. Aerial photographs from 1958 and 1974 show several areas on site that were devoid of vegetation. Areas devoid of vegetation may indicate the presence of hazardous substances in soil or other disturbances. Sample locations SS-3, SS-4, and SS-5 are in the currently devegetated area in the west central part of the site, approximately 350 feet east of the western boundary. Sample location SS-6, SS-7, and SS-8 are in the currently devegetated area in the central part of the site, approximately 150 feet west of the irrigation canal. Sample location SS-9, SS-10, and SS-11 are in the currently devegetated area in the western part of the site, approximately 150 feet east of the western boundary. Subsurface soil samples will be collected at sample locations SS-3, SS-4, SS-6, SS-7, SS-9, and SS-10 at depths of 3 feet bgs. In addition, subsurface soil samples will be collected at sample locations SS-3, SS-6, and SS-9 at depths of 8 feet bgs to determine the potential vertical extent of contamina-

tion.

**Example bullet for sampling locations set on a grid:**

- Soil samples will be collected from six different locations (SS-12 to SS-17) to determine the presence and concentrations of metals, volatile organic compounds, and pesticides in the area of a buried surface impoundment. An historic aerial photograph shows the buried surface impoundment covering an area of approximately 35 feet by 50 feet. A 50-foot by 70-foot sampling area should compensate for any uncertainties in impoundment location and include all of the impoundment area. Sampling locations will be selected using this 50-foot by 70-foot sampling grid. Figure 3-1 (not included) shows sampling locations set on a grid in the buried surface impoundment area.

For soil sampling locations not located on a grid (all samples except for SS-12 to SS-17), exact locations will be determined in the field based on accessibility, visible signs of potential contamination (e.g., stained soils), and topographical features which may indicate location of hazardous substance disposal (e.g., depressions that may indicate a historic excavation). Any deviations will be described in the SI report.

### **3.3.2 Sediment Sampling.**

Include subsection 3.3.2 if sediments are to be sampled. Otherwise delete and renumber the remaining subsections accordingly.

The first paragraph should provide a general overview of sediment sampling including the surface water body(ies) to be sampled, the number of sediment sampling locations, and the depth of each sample.

**EXAMPLE:**

**3.3.2 Sediment Sampling.** As shown in Figure 3-2 (not included), sediment samples will be collected from five locations in Strawberry Creek. Samples will be collected from a depth of 0 to 6 inches below the sediment surface at each location.

The second paragraph should describe the analytical methods that will be used to analyze sediment samples and the rationale for choosing each method. An example paragraph is included above in sub-subsection 3.3.1.

Finally, the rationale for choosing each sampling location or group of locations (including background locations) should be included.

**EXAMPLE:**

The following rationale were used to determine the sample locations:

- Sample location SD-1 is immediately upstream of the site on the west bank of Strawberry Creek. Sample SD-1 will be used to establish background concentrations upstream of the site.
- Sample location SD-2 is in Strawberry Creek immediately downstream of the probable point of entry into the stream for surface water runoff from northern areas of the site. Metal plating waste might have been discharged to northern areas of the site and runoff from these areas might have contaminated Strawberry Creek.

### **3.3.3 Groundwater Sampling.**

Include subsection 3.3.3 if groundwater is to be sampled. Otherwise delete and renumber the remaining subsections accordingly.

The first paragraph should provide a general overview of groundwater sampling including the number and types of wells to be sampled (e.g., three domestic wells, five monitoring wells, two municipal wells), the position of sampled wells relative to the site (e.g., upgradient, onsite, or downgradient), and the depth to groundwater and direction of groundwater flow under the site.

#### **EXAMPLE:**

**3.3.3 Groundwater Sampling.** As shown in Figure 3-3 (not included), groundwater sampling will be conducted at three domestic wells, one hydraulically upgradient of the site and the other two hydraulically downgradient. The depth to groundwater in the Stockton area is approximately 12 feet bgs and groundwater underneath the site flows to the southwest.

The second paragraph should describe the analyses for groundwater samples and the rationale for choosing each analysis. An example of this is included above in sub-subsection 3.3.1.

Finally, the rationale for choosing each sampling location or group of locations (including background locations) should be included.

#### **EXAMPLE:**

The following rationale were used to determine the sample locations:

- Sample location GW-1 is hydraulically upgradient from the site and will be used for the designated background groundwater sample. Background samples are intended to be representative of conditions that exist in the site vicinity. Sample location GW-1 is the well at Township 7 North, Range 21 West, Section 2, Lot K, which is approximately 0.75 mile north of the site.

- Sample locations GW-2 and GW-3 are hydraulically downgradient from the site and will be used to determine the presence and measure the concentration of contaminants in groundwater downgradient of the site. Sample location GW-2 is the shallow sand-point well at the residence adjacent to southwest corner of the site. Although four shallow wells are adjacent to the southwest corner of the site, the westernmost well is currently being used to supply irrigation water and was therefore chosen. Sample location GW-3 is the well at Township 7 North, Range 21 West, Section 14, Lot H, which is approximately 0.5 miles south of the site. Sample location GW-3 was chosen to assist in the determination of the extent of potential groundwater contamination.

#### **4.0 REQUEST FOR ANALYSES**

This section provides information necessary for obtaining analytical services through EPA's Contract Laboratory Program (CLP) and/or from a non-CLP laboratory. The introductory section provides the site name, CERCLIS identification number, anticipated sampling dates, sample matrices and concentrations, number of samples, and analytical procedures. CLP analyses will either be Contract Laboratory Program Analytical Services (CLPAS), Region Analytical Program (RAP), or a combination of these two analytical services (CLPAS+RAP). The FSP should distinguish among CLPAS, RAP, and CLPAS+RAP analyses; however, the Regional Sample Control Coordinator (RSCC) may change these designations because of factors involved in selecting a CLP laboratory.

In July 1994, the national Special Analytical Services (SAS) program was discontinued. The Environmental Services Branch's Regional Analytical Program (RAP) was initiated to provide analytical services within the capabilities of the Region IX Laboratory and laboratories under the EPA Region IX Blanket Purchase Agreement. In September 1994, the national Routine Analytical Services (RAS) program changed its name to the Contract Laboratory Program Analytical Services (CLPAS). Therefore, RAS analyses are now known as CLPAS analyses and SAS analyses, if within the capabilities of the EPA Region IX Laboratory or commercial laboratories under the EPA Region IX Blanket Purchase Agreement, are now known as RAP analyses.

Currently, under the CLPAS program, five types of analyses are available for soil and/or water matrices: volatiles, semivolatiles, pesticides/PCBs, 2,3,7,8-TCDD (dioxin), and metals and cyanide. Under the CLPAS program, surface water sediment samples are analyzed as soil/sediment samples. The organic compounds included in the CLPAS analyses are on the CLP Target Compound List (TCL) and the inorganic compounds are on the CLP Target Analyte List (TAL). Appendix C of the **Preparation of a U.S. EPA Region IX Sample Plan for EPA-Lead Superfund Projects** guidance document (QAMS, U.S. EPA, Region IX, August 1993) lists all compounds on the TCL and the TAL together with

associated contract required quantitation limits (CRQLs) or Contract Required Detection Limits (CRDLs).

RAP analyses include all non-routine (i.e., non-CLPAS) analytical methods and non-routine sample matrices (e.g., air, wastes, oil, etc.). CLPAS+RAP analyses are modifications to the CLPAS procedures such as fast turnaround times, different QC requirements, or different sample preparation techniques. All samples suspected of containing an analyte concentration over 10,000 mg/kg is considered a medium or high concentration sample. Otherwise, all samples should be considered low concentration samples.

A Client Request Form (CRF) must be included for all chemical analyses except CLPAS analyses. In general, the CRF should be submitted as an appendix to the FSP but must be independent and separable from the FSP as well. A CRF must be submitted following the format outlined in the **Standard Operation Procedure (SOP) for the Completion of SAS CRFs and Preparation of Laboratory QC Summary Report Forms** (Revision 3, August 11, 1993). QAMS has prepared generic CRFs for some RAP procedures and maintains a file of QAMS-reviewed CRFs written by sample plan authors. If submitting a previously-used CRF, always contact QAMS to ensure that this is still the most recent revision for a particular analysis. See the guidance documents **Preparation of a U.S. EPA Region IX Sample Plan for EPA-Lead Superfund Projects** (QAMS, U.S. EPA, Region IX, August 1993) and the **SOP for the Completion of SAS CRFs** (August 11, 1993) for further information on completing CRF forms.

The \_\_\_\_\_ [Site Name] site was identified as a potential hazardous waste site and entered into the CERCLIS database on \_\_\_\_\_ [CERCLIS Discovery Date] ( \_\_\_\_\_ [CERCLIS ID Number]). \_\_\_\_\_ [Name of agency/organization conducting sampling event] will conduct this field sampling effort to gather data as part of an \_\_\_\_\_ [Type of sampling event; i.e. SI, ESI, IA] under CERCLA. The anticipated sampling dates for this sampling effort are \_\_\_\_\_ [Date] to \_\_\_\_\_ [Date]. The following samples (including duplicate, QA/QC, and equipment rinsate samples) will be collected and analyzed as part of this effort:

• \_\_\_\_\_ [number of samples, written out] ( \_\_\_\_\_ [number of samples]) \_\_\_\_\_ [low/medium/high] concentration \_\_\_\_\_ [matrix; e.g., soil] samples for \_\_\_\_\_ [include list of requested analyses].

Include a separate bullet for each matrix to be sampled. The water matrix covers surface water, groundwater, and rinsate blank samples.

#### **EXAMPLE:**

**The Cadmium and Chromium Plating site was identified as a potential hazardous waste site and entered into the CERCLIS database on August 19, 1985 (CAD 123456789). BEI will conduct this field sampling effort to gather data as part of an SI under CERCLA. The anticipated sampling dates for this sampling effort are December 16, 1994 to December 20, 1994. The following samples (including duplicate, QA/QC, and equipment rinsate samples) will be collected and analyzed as part of this effort:**

• **Thirty-one (31) low concentration surface and subsurface soil samples for CLPAS metals, CLPAS volatile organic compounds, CLPAS pesticides/PCBs, and RAP organophosphorus pesticides using EPA Method 8141.**

• **Nineteen (19) low concentration groundwater and equipment rinsate blank samples for CLPAS metals, CLPAS volatile organic compounds, CLPAS pesticides/PCBs, and RAP organophosphorus pesticides using EPA Method 8141.**

#### **4.X \_\_\_\_\_ [Matrix Name] Sample Analyses**

**A separate Request for Analyses Table must be included for each matrix to be sampled. A narrative subsection should introduce each table and note any special requests such as fast turnaround times, different QA/QC requirements, or different sample preparation techniques.**

**Each Request for Analyses Table must list analytical parameters on a sample by sample basis in a tabular format and include information on container types, sample volumes, preservatives, special handling and analytical holding times for each parameter, all QA/QC samples (blanks, background samples, duplicates, splits, and Lab QC samples), and at least a weekly sampling schedule. If extra volume is needed for lab QA/QC samples (i.e., for water samples), this is noted on the tables. Example Request for Analyses Tables follow Section 4.0.**

As described in Table 4-\_\_\_\_, \_\_\_\_ [matrix; e.g., soil] samples will be taken at \_\_\_\_ [total number of locations] locations: \_\_\_\_ [sample location numbers] and background locations \_\_\_\_ [background sample location numbers]. \_\_\_\_ ["Single" or "Double" depending on lab QA/QC requirements] volume \_\_\_\_ [matrix] samples collected at the following sample locations will be identified to the laboratory for use in laboratory quality assurance/quality control (QA/QC): \_\_\_\_ [QA/QC sample numbers]. Duplicate \_\_\_\_ [matrix] samples will be collected at the following sample locations: \_\_\_\_ [locations for sample duplicates].

As shown in Table 4-\_\_\_\_, each \_\_\_\_ [matrix] sample (including laboratory QA/QC samples) will be analyzed using the CLP for \_\_\_\_ [include list of requested analyses].

#### EXAMPLE:

#### 4.1 Soil Sample Analyses

**As described in Table 4-1, soil samples will be taken at 28 locations: SS-3 through SS-28 and background locations SS-1 and SS-2. Single volume soil samples collected at the following sample locations will be identified to the laboratory for use in laboratory quality assurance/quality control (QA/QC): SS-7 and SS-19. These samples were chosen as the designated QA/QC samples because they are from within the two onsite surface impoundments which are suspected sources of contamination. Duplicate surface soil samples will be collected at the following sample locations: SS-5, SS-12, and SS-23. These sample locations were chosen as the duplicate sample locations because previous sampling data indicates the presence of VOCs in soil samples collected from these areas.**

**As shown in Table 4-1, each surface soil sample (including laboratory QA/QC samples) will be analyzed using the CLP for CLPAS metals, CLPAS volatile organic compounds, CLPAS pesticides/PCBs, and RAP organophosphorus pesticides using EPA Method 8141.**

#### 4.XX \_\_\_\_\_ [Equipment Rinsate, Field, and/or Trip] Blank Analyses

This is the final subsection of Section 4.0 and describes sample analyses for equipment rinsate, field, and/or trip blanks.. In general equipment, rinsate blanks will be collected when reusable, non-disposable sampling equipment (e.g., trowels, hand augers, and groundwater sampling bailers) are being used for the sampling event. Equipment rinsate blanks can be collected for soil, sediment, and water samples. Only one blank sample per matrix per day should be collected. If equipment rinsate blanks are collected, field blanks and trip blanks are not required under normal circumstances. A minimum of one equipment rinsate blank is prepared each day for each matrix when equipment is decontaminated in the field. Field blanks are collected when sampling water or air and equipment decontamination is not necessary or a sample collection vessel is not used (e.g., dedicated pumps). A minimum of one field blank is prepared each day sampling occurs in the field but equipment is not decontaminated. Trip blanks are required only if no other type of blank will be collected for volatile organic compound analysis and when air and/or water samples are being collected. If trip blanks are required, one is submitted to the laboratory for analysis with every shipment of samples for VOC analysis. These blanks are submitted "blind" to the laboratory, packaged like other samples and each with its own unique identification number.

As with other subsections of Section 4.0, the narrative section for blank samples should introduce the Request for Analyses Table and note any special requests such as fast turnaround times, different QA/QC requirements, or different sample preparation techniques. Blank sample request for analyses may be included on the same table (Matrix = Water) *as the request for analyses for surface water and groundwater samples.*

\_\_\_\_\_ [Equipment Rinsate, Field, and/or Trip] blanks will be prepared as described in Section 8.1. Equipment rinsate samples will be analyzed using the CLP for \_\_\_\_\_ [include list of requested analyses].

As trip blanks are prepared before arriving at the site, the following paragraph only addresses equipment rinsate and *field blanks.*

The \_\_\_\_\_ [equipment rinsate and/or field] blanks will be prepared \_\_\_\_\_ [describe where and when equipment rinsate and/or field blank samples are to be taken]. Table 4-\_\_\_\_ shows the tentative locations for \_\_\_\_\_ [equipment rinsate and/or field] blanks. *[One or two additional sentences can be added to describe specific*



*sample locations.] A minimum of one \_\_\_\_\_[equipment rinsate or field] blank will be collected each day per matrix that sampling equipment is decontaminated in the field.*

**EXAMPLE:**

**Equipment rinsate blanks will be prepared as described in Section 8.1. Equipment rinsate samples will be analyzed using the CLP for CLPAS metals, CLPAS volatile organic compounds, CLPAS pesticides/PCBs, and RAP organophosphorus pesticides using EPA Method 8141. The equipment rinsate blanks will be prepared following the decontamination of soil and groundwater sampling equipment used to collect samples from sample locations most likely to be contaminated. Table 4-2 shows the tentative locations for equipment rinsate blanks. Five equipment rinsate blanks will be prepared following the decontamination of the sampling equipment used to collect soil samples at sample locations SS-1, SS-5, SS-10, SS-14, and SS-27. One equipment rinsate blank will be prepared following the decontamination of sampling equipment used to collect groundwater sample GW-2. A minimum of one equipment rinsate blank will be collected each day that sampling equipment is decontaminated in the field.**

**Table 4-1 (SEE SEPARATE FILE: TABLES.PDF)**

## **5.0 METHODS AND PROCEDURES**

Section 5.0 provides generic procedures for collecting surface soil samples, subsurface soil samples, surface water sediment samples, and groundwater samples. Attachment A includes additional generic procedures for surveys, well inspection, development of existing groundwater wells using a surge block, well slug tests, surface water sampling, and spring water sampling. Depending upon site-specific conditions, unneeded subsections in Section 5.0 should be deleted and relevant procedures from Attachment A added. Additionally, generic procedures might need to be modified or new procedures be written. Subsections should then be renumbered accordingly.

This section describes the methods and procedures that will be used to \_\_\_\_\_[List sampling activities, i.e. “...collect soil and groundwater samples”]. All samples will be handled in accordance with approved QAPjP procedures and the chain-of-custody guidelines specified in Section 7.3 and transferred into pre-cleaned containers. The containers will be labeled as described in Section 7.5, sealed with tape, and placed in coolers for transport to the laboratory. Samples will be collected in containers and preserved as specified in Section 7.2. Samplers will don clean, disposable latex gloves at each sampling location.

*If applicable, health and safety field procedures should be briefly described in a second introductory paragraph.*

**EXAMPLE:**

**Air monitoring will be conducted prior to and during all sampling activities using an organic vapor meter (OVM) and a Mini Ram Dust/Aerosol monitor. Because the types of hazardous substances deposited on site are unknown, air monitoring will be conducted as it is suspected that organic vapors and airborne particles may be present on site. In addition, radionuclide monitoring will be conducted using a scintillator or geiger counter prior to and during all sampling activities. Since the landfill was used by DOD in an unregulated manner, it is possible that radioactive substances were deposited on site as well. Air and radionuclide monitoring will be conducted as described in Section 7.0 of the Health and Safety Plan (included as Appendix C).**

## **5.1 SOIL SAMPLING**

### **5.1.1 Surface Soil Sampling**

***Use this subsection for surface soil samples that are to be collected using hand trowels. In general, hand trowels are appropriate only for samples collected within 6 inches of ground surface.***

***Include this paragraph first if exact sampling locations are to be set in the field:***

Exact soil sampling locations will be determined in the field based on accessibility, visible signs of potential

contamination (e.g., stained soils), and topographical features which may indicate location of hazardous substance disposal (e.g., depressions that may indicate a historic excavation). Soil sample locations will be recorded in the field logbook when sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

*If soil samples are to be analyzed for volatile compounds and other analytes, use this paragraph:*

Surface soil samples will be collected as grab samples (independent, discrete samples) from a depth of 0 to \_\_\_\_[depth] inches\* bgs. Surface soil samples will be collected using a stainless steel hand trowel. Samples to be analyzed for CLPAS volatile organic compounds will be collected first. Samples to be analyzed for CLPAS volatile organic compounds will be transferred directly from the trowel into the appropriate sample containers. Samples to be analyzed for \_\_\_\_\_ [list all analytical methods for soil samples except for volatile organic compounds] will be placed in a sample-dedicated 1-gallon disposable pail and homogenized with a trowel. Material in the pail will be transferred with a trowel from the pail to the appropriate sample containers. Sample containers will be filled to the top with measures taken to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration to or from the sample. After sample containers are filled, they will be immediately sealed, chilled if appropriate, and processed for shipment to the laboratory.

*If soil samples are to be analyzed only for volatile compounds, use this paragraph:*

Surface soil samples will be collected as grab samples (independent, discrete samples) from a depth of 0 to \_\_\_\_[depth] inches\* bgs. Surface soil samples will be collected using a stainless steel hand trowel. Samples will be transferred directly from the trowel into the appropriate sample containers. Sample containers will be filled to the top with measures taken to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration to or from the sample. After sample containers are filled, they will be immediately sealed, chilled, and processed for shipment to the laboratory.

*If soil samples are not to be analyzed for volatile compounds, use this paragraph:*

Surface soil samples will be collected as grab samples (independent, discrete samples) from a depth of 0 to \_\_\_\_[depth] inches\* bgs. Surface soil samples will be collected using a stainless steel hand trowel. Samples will be placed in a sample-dedicated 1-gallon disposable pail and homogenized with a trowel. Material in the pail will be transferred with a trowel from the pail to the appropriate sample containers. Sample containers will be filled to the top with measures taken to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration to or from the sample. After sample containers are filled, they will be immediately sealed, chilled if appropriate, and processed for shipment to the laboratory.

\* Note, if referring to sample depths in feet, change this reference accordingly. For soil sampling, units of depth should be consistent for all sampling references (i.e., inches or feet).

### **5.1.2 Subsurface Soil Sampling**

Use this subsection if subsurface soil samples are to be collected using hand augers.

*Include this paragraph first if exact sampling locations are to be set in the field:*

Exact soil sampling locations will be determined in the field based on accessibility, visible signs of potential contamination (e.g., stained soils), and topographical features which may indicate location of hazardous substance disposal (e.g., depressions that may indicate a historic excavation). Soil sample locations will be recorded in the field logbook when sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

*If soil samples are to be analyzed for volatile and other compounds, use this paragraph:*

Subsurface samples will be collected by boring to the desired sample depth using a 3-inch-diameter hand auger. Once the desired sample depth is reached, the hand auger will be removed from the hole and accumulated soil will be set aside in a

sample-dedicated, disposable pail or on a sample-dedicated, disposable tarp. A different, clean hand auger will be inserted into the hole and used to collect the sample. Samples to be analyzed for CLPAS volatile organic compounds will be collected first. Samples to be analyzed for CLPAS volatile organic compounds will be transferred directly from the auger with a trowel to the appropriate sample containers. Samples to be analyzed for \_\_\_\_\_[list all analytical methods for soil samples except for volatile organic compounds] will be transferred from the auger to a sample-dedicated 1-gallon disposable pail and homogenized with a trowel. Material in the pail will be transferred with a trowel from the pail to the appropriate sample containers. Sample containers will be filled to the top with measures taken to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration to or from the sample. After sample containers are filled, they will be immediately sealed, chilled if appropriate, and processed for shipment to the laboratory.

*If soil samples are to be analyzed only for volatile compounds, use this paragraph:*

Subsurface samples will be collected by boring to the desired sample depth using a 3-inch-diameter hand auger. Once the desired sample depth is reached, the hand auger will be removed from the hole and accumulated soil will be set aside in a sample-dedicated, disposable pail or on a sample-dedicated, disposable tarp. A different, clean hand auger will be inserted into the hole and used to collect the sample. Samples will be transferred directly from the auger with a trowel to the appropriate sample containers. Sample containers will be filled to the top with measures taken to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration to or from the sample. After sample containers are filled, they will be immediately sealed, chilled, and processed for shipment to the laboratory.

*If soil samples are not to be analyzed for volatile compounds, use this paragraph:*

Subsurface samples will be collected by boring to the desired sample depth using a 3-inch-diameter hand auger. Once the desired sample depth is reached, the hand auger will be removed from the hole and accumulated soil will be set aside in a sample-dedicated, disposable pail or on a sample-dedicated, disposable tarp. A different, clean hand auger will be inserted into the hole and used to collect the sample. Samples will be transferred from the auger to a sample-dedicated 1-gallon disposable pail and homogenized with a trowel. Material in the pail will be transferred with a trowel from the pail to the appropriate sample containers. Sample containers will be filled to the top with measures taken to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration to or from the sample. After sample containers are filled, they will be immediately sealed, chilled if appropriate, and processed for shipment to the laboratory.

*Include this as the final paragraph regardless of the analyses for soil samples:*

Excess soil from the sampled interval will be repacked into the hole. Set-aside soil from the interval above the sampled interval will then be repacked into the hole.

## **5.2 Sediment Sampling**

Include this subsection if sediment samples are to be collected.

*Include this paragraph first if exact sediment sampling locations are to be set in the field:*

Exact sediment sampling locations will be determined in the field, based on accessibility and features which may affect sediment deposition. Ideal sampling locations will be backwater areas if they exist, near the inner bank of a \_\_\_\_\_[river/stream/creek/slough] bend, near the \_\_\_\_\_[river/ stream/creek/slough] bank in straight portions, or near pilings or other flow obstructions. These areas generally have the slowest moving water for a given \_\_\_\_\_[river/stream/creek/slough] reach and sediments will tend to settle here. Sediment sampling will progress from downstream to upstream locations in order to reduce the impact of sediment sampling on subsequent samples.

The following paragraph describes sediment sample collection with a piston-type hand-held sediment sampler. Depending upon site-specific conditions, another type of sampling equipment might be more appropriate. When sampling very shallow or intermittent streams a trowel will probably be the most appropriate sampling equipment. Likewise, for rocky or cobbled stream bottoms and for deeper water, a dredge sampler might be most appropriate equipment with which to collect samples. If necessary, the following paragraph should be modified to reflect site-specific conditions or *sample collection with a different type of equipment.*

Sediment samples will be collected from the \_\_\_\_\_[river/stream/creek/slough] bottom from a depth of 0 to 6 inches using a pre-cleaned United States Geological Survey-approved piston-type hand sediment sampler. The piston-type hand sampler consists of an approximately 3-inch diameter solid steel tube with a “T”-handle welded to the top. A non-metallic plunger sealed with an O-ring slides through the center of the tube. The plunger and O-ring maintain sample integrity as the sampler is withdrawn from the sediments. The hand-held sampler is pushed and twisted into the sediments while the plunger is drawn upwards. When the sampler is 6 inches into the sediments, it will be slowly withdrawn.

The final paragraph describes sample homogenization and container filling. Include this paragraph, or a modified form of it, for all sediment sampling. It is assumed that sediment samples will not be analyzed for volatile compounds. If sediment is to be analyzed for volatile compounds, the samples to be analyzed for volatile compounds should not be *homogenized but rather transferred directly from the sampler into the sample container.*

Material in the sampler will be transferred to a sample-dedicated 1-gallon disposable pail and homogenized with a trowel. Material from the pail will be transferred with a trowel from the bucket to the appropriate sample containers. Sample containers will be filled to the top and measures will be taken to prevent soil from remaining in the lid grooves prior to being sealed in order to prevent potential contamination migration to or from the sample containers. Sample containers will then be chilled if appropriate and processed for shipment to the laboratory.

### **5.3 Groundwater Sampling**

This subsection contains procedures for water-level measurements, well purging, and well sampling. Additional generic procedures for conducting well inspections, developing wells, conducting slug tests, sampling groundwater springs, and surveying onsite wells are included as an appendix to the annotated FSP. Relevant procedures should be included under *this heading with any necessary site-specific modifications. Subsections should then be renumbered accordingly.*

**5.3.1 Water-Level Measurements.** If well heads are accessible, all wells will be sounded for depth to water from top of casing and total well depth prior to purging. An electronic sounder, accurate to the nearest +/- 0.01 feet, will be used to measure depth to water in each well. When using an electronic sounder, the probe is lowered down the casing to the top of the water column, the graduated markings on the probe wire or tape are used to measure the depth to water from the surveyed point on the rim of the well casing. Typically, the measuring device emits a constant tone when the probe is submerged in standing water and most electronic water level sounders have a visual indicator consisting of small light bulb or diode that turns on when the probe encounters water. Total well depth will be sounded from the surveyed top of casing by lowering the weighted probe to the bottom of the well. The weighted probe will sink into silt, if present, at the bottom of well screen. Total well depths will be measured by lowering the weighted probe to the bottom of the well and recording the depth to the nearest 0.1 feet.

Water-level sounding equipment will be decontaminated before and after use in each well. Water levels will be measured in wells which have the least amount of known contamination first. Wells with known or suspected contamination will be measured last.

The following versions of subsections 5.3.2 and 5.3.3 contain a generic description for purging and sampling wells with dedicated pumps (i.e., operating supply wells). If wells without dedicated pumps are to be purged and sampled (i.e., sampling is to be done with bailers), this version should be deleted and a different version used. Different versions follow these versions.

**5.3.2 Purging.** All wells will be purged prior to sampling. If the well casing volume is known, a minimum of three casing volumes of water will be purged using the dedicated well pump. Water will be collected into a measured bucket to record the purge volume. Casing volumes will be calculated based on total well depth, standing water level, and casing diameter. One casing volume will be calculated as:

$$V = p \, d^2 \, h / 77.01$$

where:

V is the volume of one well casing of water (in gallons, 1 ft<sup>3</sup> = 7.48 gallon);

**d** is the inner diameter of the well casing (in inches); and

**h** is the total depth of water in the well (in feet).

Prior to the start of purging, in the middle of purging each casing volume, and after each well casing volume is purged; water temperature, pH, and specific conductance will be measured using field test meters and the measurements will be recorded. If the well casing volume is not known, water temperature, pH, and specific conductance will be measured every 2.5 minutes after starting water flow. Samples will be collected after these parameters have stabilized; indicating representative formation water is entering the well. Three consecutive measurements which display consistent values of all parameters will be taken prior to sampling. Samples will be collected after three well casing volumes (15 minutes if the purge volume is not known) if parameters have stabilized. Typically, the temperature should not vary by more than +/- 1°C, pH by more than 0.2 pH units, and specific conductance by more than 10 percent from reading to reading. No water that has been tested with a field meter probe will be collected for chemical analysis. If these parameters have not stabilized after five casing volumes have been purged (30 minutes if the purge volume is not known), purging will cease, a notation will be recorded in the field logbook and samples will be collected. In accordance with Section 7.1, depth to water measurements, field measurements of parameters, and purge volumes will be recorded in the field logbook.

If a well dewateres during purging and three casing volumes are not purged, that well will be allowed to recharge up to 80 percent of the static water column and dewatered once more. After water levels have recharged to 80 percent of the static water column, groundwater samples will be collected.

All field meters will be calibrated according to manufacturers guidelines and specifications before and after every day of field use. Field meter probes will be decontaminated before and after use at each well.

**5.3.3 Well Sampling.** Prior to sampling each well, the water level in the well will be measured as described in Section 5.3.1 and the well purged as described in Section 5.3.2. All wells will be sampled within 24 hours of purging. Supply wells with a dedicated pump will have samples taken directly from the tap closest to the well head. All aerators, strainers, or hoses will be removed from the tap prior to sample collection. The flow will be adjusted so that a gentle stream is obtained. *[If samples are to be analyzed for volatile compounds, add this sentence: "A flow rate of less than 100 milliliters per minute is recommended for samples to be analyzed for volatile organic compounds to minimize volatilization."]*

At each sampling location, all bottles designated for a particular analysis (e.g., CLPAS volatile organic compounds) will be filled sequentially before bottles designated for the next analysis are filled (e.g., CLPAS semivolatile organic compounds). If a duplicate sample is to be collected at this location, all bottles designated for a particular analysis for both sample designations will be filled sequentially before bottles for another analysis are filled. In the filling sequence for duplicate samples, bottles with the two different sample designations will alternate (e.g., CLPAS pesticides/PCBs designation GW-2, CLPAS pesticides/PCBs designation GW-4 (duplicate of GW-2), CLPAS pesticides/PCBs designation GW-2, etc.) Groundwater samples will be transferred from the tap directly into the appropriate sample containers with preservative if required, chilled if appropriate, and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the tap to the sample container.

*If samples are to be collected for volatiles analysis, the following paragraph should be added:*

Vials for volatile organic compound analysis will be filled first to minimize aeration of water in the well. A test vial will be preserved with HCl to determine the amount of preservative needed to lower the pH to less than 2. The appropriate amount of HCl will then be added to the sample vials prior to the addition of the sample. The vials will be filled directly from the tap. The vial will be inverted and checked for air bubbles to insure zero headspace. If a pea-size or larger air bubble appears, the vial contents will be emptied into the container used to measure purge volumes, the vial discarded, and a new sample will be collected.

*If some samples for metals (or other) analysis are to be filtered depending upon sample turbidity, the following paragraph should be added:*

After well purging and prior to collecting groundwater samples for CLPAS metals analyses, the turbidity of the

groundwater extracted from each well will be measured using a portable turbidity meter. A column of groundwater will be collected from the well using the tap and a small amount of water will be transferred to a disposable vial and a turbidity measurement will be taken. The results of the turbidity measurement will be recorded in the field logbook. The volume of water used to measure turbidity will be discarded after use. If the turbidity of the groundwater from a well is above 5 Nephelometric Turbidity Units (NTUs), groundwater samples will consist of both a filtered and unfiltered sample. A 5-micron filter will be used to remove larger particles that have been entrained in the water sample. A sample-dedicated Teflon tube will be attached to the tap closest to the well head. The filter will be attached to the outlet of the Teflon tube. A clean, unused filter will be used for each filtered sample collected. Groundwater samples will be transferred from the filter directly into the appropriate sample containers with a preservative and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the filter to the sample container. After the filtered sample has been collected, the Teflon tube and filter will be removed and an unfiltered sample will be collected. A sample number appended with an "F1" will represent a sample filtered with a 5 micron filter.

If samples are to be filtered for metals (or another) analysis regardless of sample turbidity, the following paragraph *should be added*:

Samples designated for CLPAS metals analysis will be filtered. A 5-micron filter will be used to remove larger particles that have been entrained in the water sample. A sample-dedicated Teflon tube will be attached to the tap closest to the well head. The filter will be attached to the outlet of the Teflon tube. A clean, unused filter will be used for each filtered sample collected. Groundwater samples will be transferred from the filter directly into the appropriate sample containers with a preservative and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the filter to the sample container. After the filtered sample has been collected, the Teflon tube and filter will be removed and an unfiltered sample will be collected. A sample number appended with an "F1" will represent a sample filtered with a 5 micron filter.

The following versions of subsections 5.3.2 and 5.3.3 contain generic descriptions for purging and sampling wells without dedicated pumps (i.e., sampling is to be done with bailers). If wells with dedicated pumps (i.e., operational supply wells) are to be sampled, these versions of these subsections 5.3.2 and 5.3.3 should be deleted and either the *preceding or following versions used*.

**5.3.2 Purging.** All wells will be purged prior to sampling. If the well casing volume is known, a minimum of three casing volumes of water will be purged using a hand pump, submersible pump, or bailer; depending on the diameter and configuration of the well. When a submersible pump is used for purging, clean flexible Teflon tubes will be used for groundwater extraction. All tubes will be decontaminated before use in each well. Pumps will be placed 2 to 3 feet from the bottom of the well to permit reasonable drawdown but to prevent cascading conditions. Water will be collected into a measured bucket to record the purge volume. Casing volumes will be calculated based on total well depth, standing water level, and casing diameter. One casing volume will be calculated as:

$$V = \pi d^2 h / 77.01$$

where:

**V** is the volume of one well casing of water (in gallons, 1 ft<sup>3</sup> = 7.48 gallon);

**d** is the inner diameter of the well casing (in inches); and

**h** is the total depth of water in the well (in feet).

Prior to the start of purging, in the middle of purging each casing volume, and after each well casing volume is purged; water temperature, pH, and specific conductance will be measured using field test meters and the measurements will be recorded. Samples will be collected after these parameters have stabilized; indicating representative formation water is entering the well. Three consecutive measurements which display consistent values of all parameters will be taken prior to sampling. Samples will be collected after three well casing volumes if parameters have stabilized. Typically, the temperature should not vary by more than +/- 1°C, pH by more than 0.2 pH units, and specific conductance by more than 10 percent from reading to reading. No water that has been tested with a field meter probe will be collected for chemical analysis. If these parameters have not stabilized after five casing volumes have been purged (30 minutes if the purge volume is not known), purging will cease, a notation will be recorded in the field logbook and samples will be collected. In

accordance with Section 7.1, depth to water measurements, field measurements of parameters, and purge volumes will be recorded in the field logbook.

If a well dewateres during purging and three casing volumes are not purged, that well will be allowed to recharge up to 80 percent of the static water column, and dewatered once more. After water levels have recharged to 80 percent of the static water column, groundwater samples will be collected.

All field meters will be calibrated according to manufacturers guidelines and specifications before and after each day of field use. Field meter probes will be decontaminated before and after use at each well.

**5.3.3 Well Sampling.** Prior to sampling each well, the water level in the well will be measured as described in Section 5.3.1 and the well purged as described in Section 5.3.2. Monitoring wells and other wells without a dedicated pump will be sampled using a \_\_\_\_\_[provide bailer description; e.g., teflon, stainless steel] bailer.

At each sampling location, all bottles designated for a particular analysis (e.g., CLPAS volatile organic compounds) will be filled sequentially before bottles designated for the next analysis are filled (e.g., CLPAS semivolatile organic compounds). If a duplicate sample is to be collected at this location, all bottles designated for a particular analysis for both sample designations will be filled sequentially before bottles for another analysis are filled. In the filling sequence for duplicate samples, bottles with the two different sample designations will alternate (e.g., CLPAS pesticides/PCBs designation GW-2, CLPAS pesticides/PCBs designation GW-4 (duplicate of GW-2), CLPAS pesticides/PCBs designation GW-2, etc.) Groundwater samples will be transferred from the bailer directly into the appropriate sample containers with preservative, if required, chilled, and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the bailer emptying device to the sample container.

*If samples are to be collected for volatiles analysis, the following paragraph should be added:*

Vials for volatile organic compound analysis will be filled first to minimize aeration of water in the well. A test vial will be preserved with HCl to determine the amount of preservative needed to lower the pH to less than 2. The appropriate amount of HCl will then be added to the sample vials prior to the addition of the sample. The vials will be filled directly from the tap. The vial will be inverted and checked for air bubbles to insure zero headspace. If a pea-size or larger air bubble appears, the vial contents will be emptied into the measured container, the vial discarded, and a new sample will be collected.

The following versions of subsections 5.3.2 and 5.3.3 contain generic descriptions for purging and sampling wells with dedicated pumps (i.e., operational supply wells) and for purging and sampling wells without dedicated (i.e., sampling is to be done with bailers) pumps. If only wells with dedicated pumps or only wells without dedicated pumps are to be sampled *during this sampling event, this version of these two subsections should be deleted and one of the above versions used.*

**5.3.2 Purging.** All wells will be purged prior to sampling. If the well casing volume is known, a minimum of three casing volumes of water will be purged using a bailer, hand pump, or submersible pump; depending on the diameter and configuration of the well. When a submersible pump is used for purging, clean flexible Teflon tubes will be used for groundwater extraction. All tubes will be decontaminated before use in each well. Pumps will be placed 2 to 3 feet from the bottom of the well to permit reasonable drawdown but to prevent cascading conditions. Water will be collected into a measured bucket to record the purge volume. Casing volumes will be calculated based on total well depth, standing water level, and casing diameter. One casing volume will be calculated as:

$$V = \pi d^2 h / 77.01$$

where:

**V** is the volume of one well casing of water (in gallons, 1 ft<sup>3</sup> = 7.48 gallon);

**d** is the inner diameter of the well casing (in inches); and

**h** is the total depth of water in the well (in feet).

If a well dewatered during purging and three casing volumes are not purged, that well will be allowed to recharge up to 80 percent of static water column, and dewatered once more. After water levels have recharged to 80 percent of the static water column, groundwater samples will be collected.

Prior to the start of purging, in the middle of purging each casing volume, and after each well casing volume is purged; water temperature, pH, and specific conductance will be measured using field test meters and the measurements will be recorded. If the well casing volume is not known, water temperature, pH, and specific conductance will be measured every 2.5 minutes after starting water flow. Operating domestic, agricultural, and industrial supply wells that are in regular operation will be purged and samples will be taken directly from the tap. Samples will be collected after these parameters have stabilized; indicating representative formation water is entering the well. Three consecutive measurements which display consistent values of all parameters will be taken prior to sampling. Samples will be collected after three well casing volumes (15 minutes if the purge volume is not known) if parameters have stabilized. Typically, the temperature should not vary by more than  $\pm 1^{\circ}\text{C}$ , pH by more than 0.2 pH units, and specific conductance by more than 10 percent from reading to reading. No water that has been tested with a field meter probe will be collected for chemical analysis. If these parameters have not stabilized after five casing volumes have been purged (30 minutes if the purge volume is not known), purging will cease, a notation will be recorded in the field logbook and samples will be collected. In accordance with Section 7.1, depth to water measurements, field measurements of parameters, and purge volumes will be recorded in the field logbook.

All field meters will be calibrated according to manufacturers guidelines and specifications before and after each day of field use. Field meter probes will be decontaminated before and after use at each well.

**5.3.3 Well Sampling.** Prior to sampling each well, the water level in the well will be measured as described in Section 5.3.1 and the well purged as described in Section 5.3.2. Monitoring wells and other wells without a dedicated pump will be sampled using a \_\_\_\_\_[provide bailer description; e.g. teflon, stainless steel] bailer. Supply wells with a dedicated pump will have samples taken directly from the tap closest to the well head. All aerators, strainers, or hoses will be removed from the tap prior to sample collection. The flow will be adjusted so that a gentle stream is obtained. *[If samples are to be analyzed for volatile compounds, add this sentence: "A flow rate of less than 100 milliliters per minute is recommended for samples to be analyzed for volatile organic compounds to minimize volatilization."]*

At each sampling location, all bottles designated for a particular analysis (e.g., CLPAS volatile organic compounds) will be filled sequentially before bottles designated for the next analysis are filled (e.g., CLPAS semivolatile organic compounds). If a duplicate sample is to be collected at this location, all bottles designated for a particular analysis for both sample designations will be filled sequentially before bottles for another analysis are filled. In the filling sequence for duplicate samples, bottles with the two different sample designations will alternate (e.g., CLPAS pesticides/PCBs designation GW-2, CLPAS pesticides/PCBs designation GW-4 (duplicate of GW-2), CLPAS pesticides/PCBs designation GW-2, etc.) Groundwater samples will be transferred from the tap or bailer directly into the appropriate sample containers with preservative if required, chilled if required, and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the tap or the bailer discharge device to the sample container.

*If samples are to be collected for volatiles analysis, the following paragraph should be added:*

Vials for volatile organic compound analysis will be filled first to minimize aeration of water in the well. A test vial will be preserved with HCl to determine the amount of preservative needed to lower the pH to less than 2. The appropriate amount of HCl will then be added to the sample vials prior to the addition of the sample. The vials will be filled directly from the tap. The vial will be inverted and checked for air bubbles to insure zero headspace. If a pea-size or larger air bubble appears, the vial contents will be emptied into the measured container, the vial discarded, and a new sample will be collected.

If some samples for metals (or other) analysis are to be filtered depending upon sample turbidity, the following paragraph should be added. If sampling wells without a dedicated operable pump, water from a bailer emptying device will not induce sufficient pressure to allow sample filtration. In this case a peristaltic pump should be used. Portions of the well sampling section will have to be rewritten to reflect this modification.

After well purging and prior to collecting groundwater samples for CLPAS metals analyses, the turbidity of the groundwater extracted from each well will be measured using a portable turbidity meter. A column of groundwater will be



collected from the well using the tap and a small amount of water will be transferred to a disposable vial and a turbidity measurement will be taken. The results of the turbidity measurement will be recorded in the field logbook. The volume of water used to measure turbidity will be discarded after use. If the turbidity of the groundwater from a well is above 5 Nephelometric Turbidity Units (NTUs), groundwater samples will consist of both a filtered and unfiltered sample. A 5-micron filter will be used to remove larger particles that have been entrained in the water sample. A sample-dedicated Teflon tube will be attached to the tap closest to the well head. The filter will be attached to the outlet of the Teflon tube. A clean unused filter will be used for each filtered sample collected. Groundwater samples will be transferred from the filter directly into the appropriate sample containers with a preservative and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the filter to the sample container. After the filtered sample has been collected, the Teflon tube and filter will be removed and an unfiltered sample will be collected. A sample number appended with an "F1" will represent a sample filtered with a 5 micron filter.

If samples are to be filtered for metals (or another) analysis regardless of sample turbidity, the following paragraph should be added. If sampling wells without a dedicated operable pump, water from a bailer emptying device will not induce sufficient pressure to allow sample filtration. In this case a peristaltic pump should be used. Portions of the well *sampling section will have to be rewritten to reflect this modification.*

Samples designated for CLPAS metals analysis will be filtered. A 5-micron filter will be used to remove larger particles that have been entrained in the water sample. A sample-dedicated Teflon tube will be attached to the tap closest to the well head. The filter will be attached to the outlet of the Teflon tube. A clean, unused filter will be used for each filtered sample collected. Groundwater samples will be transferred from the filter directly into the appropriate sample containers with a preservative and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the filter to the sample container. After the filtered sample has been collected, the Teflon tube and filter will be removed and an unfiltered sample will be collected. A sample number appended with an "F1" will represent a sample filtered with a 5 micron filter.

#### **5.4 Equipment Rinsate Blanks**

Include this subsection if equipment rinsate blanks will be collected. This is generally the case for all FSPs. Only one blank sample per matrix per day should be collected. If equipment rinsate blanks are collected, field blanks and trip blanks are not required under normal circumstances.

*Include this paragraph if blanks will be analyzed for both metals and organic compounds, otherwise delete:*

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring high performance liquid chromatography (HPLC) solvent free water (for organics) or deionized water (for inorganics) over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be analyzed using the CLP Laboratory for \_\_\_\_\_[include names of target analytes, e.g., "CLPAS metals" or "CLPAS pesticides/PCBs"].

*Include this paragraph if blanks will be analyzed only for organic compounds, otherwise delete:*

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring laboratory-grade, certified organic-free water over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be analyzed using the CLP Laboratory for \_\_\_\_\_[include names of target analytes, e.g., "CLPAS volatile organic compounds" or "CLPAS pesticides/PCBs"].

*Include this paragraph if blanks will be analyzed only for metals, otherwise delete:*

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring deionized water over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be

analyzed using the CLP Laboratory for CLPAS metals.

*Always include this paragraph:*

The equipment rinsate blanks will be preserved, packaged, and sealed in the manner described in Section 7.5 of this sample plan. A separate CLP sample number and station number will be assigned to each sample, and it will be submitted blind to the laboratory.

## **5.5 Field Blanks**

Include this subsection if field blanks will be collected. Only one blank sample per matrix per day should be collected. If field blanks are prepared then equipment rinsate blanks and trip blanks are not required under normal circumstances.

*Include this paragraph if blanks will be analyzed for both metals and organic compounds, otherwise delete:*

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling procedures. Field blank samples will be obtained by pouring high performance liquid chromatography (HPLC) solvent free water (for organics) and/or deionized water (for inorganics) into a sampling container at the sampling point.. The field blanks that are collected will be analyzed using the CLP Laboratory for \_\_\_\_\_[include names of target analytes, e.g., “CLPAS metals” or “CLPAS pesticides/PCBs”].

*Include this paragraph if blanks will be analyzed only for organic compounds, otherwise delete:*

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling procedures. Field blank samples will be obtained by pouring laboratory-grade, certified organic-free water into a sampling container at the sampling point.. The field blanks that are collected will be analyzed using the CLP Laboratory for \_\_\_\_\_[include names of target analytes, e.g., “CLPAS volatile organic compounds” or “CLPAS pesticides/PCBs”].

*Include this paragraph if blanks will be analyzed only for metals, otherwise delete:*

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling procedures. Field blank samples will be obtained by pouring deionized water into a sampling container at the sampling point. The field blanks that are collected will be analyzed using the CLP Laboratory for CLPAS metals.

*Always include this paragraph:*

The field blanks will be preserved, packaged, and sealed in the manner described in Section 7.5 of this sample plan. A separate CLP sample number and station number will be assigned to each sample, and it will be submitted blind to the laboratory.

## **5.6 Trip Blanks**

Include this subsection if trip blanks will be collected. Only one blank sample per matrix per day should be collected. If *trip blanks are prepared, equipment rinsate blanks and field blanks are not required under normal circumstances.*

Trip blanks will be prepared to evaluate if the shipping and handling procedures are introducing contaminants into the sample stream and if cross contamination in the form of VOC migration has occurred among the collected samples. Trip blanks will be prepared by pouring high performance liquid chromatography (HPLC) solvent free water into 40 milliliter (ml) vials prior to arriving at the site, sealing the vials and then shipping them with empty sample containers to the site. The sealed trip blanks are not opened in the field and are shipped to the laboratory in the same cooler with the samples collected for volatile organic compound analyses.

The trip blanks will be preserved, packaged, and sealed in the manner described in Section 7.5 of this sample plan. A separate CLP sample number and station number will be assigned to each trip sample and it will be submitted blind to the laboratory.

## 5.7 Temperature Blanks

In order to fully and accurately evaluate potential effects of sample transportation and handling on data quality, it is recommended that a temperature blank be enclosed in each sample shipping container when samples requiring preservation by chilling are transported. A 40-ml VOA would serve as an adequate temperature blank container. The temperature blank should be clearly marked to indicate its purpose to the laboratory. The temperature blank should be handled in exactly the same manner as the actual samples. In other words, if the samples are wrapped in padding, the temperature blank should be wrapped in padding; if the samples are chilled in ice water before packaging and shipment, the temperature blank should also be chilled in ice water before packaging and shipment.

## 5.7 Decontamination Procedures

*This subsection should be included in all FSPs.*

The decontamination procedures that will be followed are in accordance with approved QAPjP procedures. Decontamination of sampling equipment must be conducted consistently as to assure the quality of samples collected. All equipment that comes into contact with potentially contaminated soil or water will be decontaminated. Disposable equipment intended for one time use will not be decontaminated but will be packaged for appropriate disposal. Decontamination will occur prior to and after each use of a piece of equipment. All sampling devices used, including trowels and augers, will be steam-cleaned or decontaminated according to EPA Region IX recommended procedures.

The following, to be carried out in sequence, is an EPA Region IX recommended procedure for the decontamination of sampling equipment:

- Non-phosphate detergent and tap water wash, using a brush if necessary
- Tap-water rinse

*(Include the following two bullets when sampling for metals, otherwise delete and continue with the remaining bullets.)*

- 0.1 N nitric acid rinse
- Deionized/distilled water rinse

*(Include the following two bullets when sampling for organic compounds, otherwise delete and continue with the remaining bullets.)*

- Pesticide-grade solvent (reagent grade hexane) rinse in a decontamination bucket
- Deionized/distilled water rinse (twice)
- Organic-free water rinse (HPLC) grade

Equipment will be decontaminated in a predesigned area on pallets or plastic sheeting, and clean bulky equipment will be stored on plastic sheeting in uncontaminated areas. Cleaned small equipment will be stored in plastic bags. Materials to be stored more than a few hours will also be covered.

NOTE: A different decontamination procedure may be used; but if this is so, provide the rationale for using the different approach. Do not use a TCL volatile compound, such as acetone, for the solvent rinse when volatile organic analyses are required.

## 6.0 DISPOSAL OF RESIDUAL MATERIALS

This section describes how investigation-derived wastes (IDW) will be disposed. Generic descriptions for IDW from low-concentration soil and groundwater sampling events are provided. Depending upon site-specific conditions and

applicable federal, state, and local regulations; other provisions for IDW disposal might have to be written. If any analyses (CLP or non-CLP laboratories) of IDW are required, these should be discussed. If IDW are to be drummed, labeling for the drums should be discussed here to ensure appropriate disposal of drummed waste.

In the process of collecting environmental samples at the \_\_\_\_\_ [Site Name] site during the SI [or name of other investigation], the \_\_\_\_\_ [Name of your organization/agency] site team will generate different types of potentially contaminated investigation-derived wastes (IDW) that include the following:

- Used personal protective equipment (PPE)
- Disposable sampling equipment
- Decontamination fluids

*Include this bullet when sampling soils, otherwise delete:*

- Soil cuttings from soil borings.

*Include this bullet when sampling groundwater, otherwise delete:*

- Purged groundwater and excess groundwater collected for sample container filling.

The EPA's National Contingency Plan (NCP) requires that management of IDW generated during SIs comply with all applicable or relevant and appropriate requirements (ARARs) to the extent practicable. The sampling plan will follow the *Office of Emergency and Remedial Response (OERR) Directive 9345.3-02* (May 1991) which provides the guidance for the management of IDW during SIs [or other investigation type]. In addition, other legal and practical considerations that may affect the handling of IDW will be considered.

Listed below are the procedures that will be followed for handling the IDW. The procedures have enough flexibility to allow the site investigation team to use its professional judgment on the proper method for the disposal of each type of IDW generated at each sampling location:

The following bullet is generally appropriate for sites with low levels of contamination. If higher levels of contamination exist at the site, other disposal methods (such as the drumming of wastes) should probably be used to dispose of used PPE and disposable sampling equipment.

- Used PPE and disposable equipment will be double bagged and placed in a municipal refuse dumpster on site. These wastes are not considered hazardous and can be sent to a municipal landfill. Any PPE and disposable equipment that is to be disposed of which can still be reused will be rendered inoperable before disposal in the refuse dumpster.

*Include this bullet if sampling for both metals and organics, otherwise delete:*

- Decontamination fluids that will be generated in the SI will consist of dilute nitric acid, pesticide-grade solvent, HPLC or deionized water, residual contaminants, and water with non-phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal at the site. The water (and water with detergent) will be poured onto the ground or into a storm drain. Pesticide-grade solvents will be allowed to evaporate from the decontamination bucket. The nitric acid will be diluted and/or neutralized with sodium hydroxide and tested with pH paper before pouring onto the ground or into a storm drain.

*Include this bullet if sampling for metals but not organics, otherwise delete:*

- Decontamination fluids that will be generated in the SI will consist of nitric acid, HPLC or deionized water, residual contaminants, and water with non-phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal at the site. The water (and water with detergent) will be poured onto the ground or into a storm drain. The nitric acid will be diluted and/or neutralized with sodium hydroxide and tested with pH paper before pouring onto the ground or into a storm drain.

*Include this bullet if sampling for organics but not metals, otherwise delete:*

- Decontamination fluids that will be generated in the SI will consist of pesticide-grade solvent, HPLC or deionized water, residual contaminants, and water with non-phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal at the site. The water (and water with detergent) will be poured onto the ground or into a storm drain. Pesticide-grade solvents will be allowed to evaporate from the decontamination bucket.

*Include this bullet if sampling soils, otherwise delete:*

- Soil cuttings generated during the subsurface sampling will be placed back into the soil borings from which the samples were obtained. Any remaining soil cuttings will be spread around the sampling location.

*Include this bullet if sampling groundwater, otherwise delete:*

- Purged groundwater will be \_\_\_\_\_ [depending upon the degree of groundwater contamination; site-specific conditions; and applicable federal, state, and local regulations; disposal methods will vary. Disposal methods can vary for purge water from different wells sampled during the same sampling event]

## **7.0 SAMPLE DOCUMENTATION AND SHIPMENT**

### **7.1 Field Logbooks**

Include this section in all FSPs. The list of items to be included in the field logbooks can be adjusted to reflect site-specific conditions. For example, references to instrument readings should be deleted if no instrumentation is to be used during the sampling event.

Field logbooks will document where, when, how, and from whom any vital project information was obtained. Logbook entries will be complete and accurate enough to permit reconstruction of field activities. A separate logbook will be maintained for each project. Logbooks are bound with consecutively numbered pages. Each page will be dated and the time of entry noted in military time. All entries will be legible, written in black ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions or other terminology which might prove inappropriate.

At a minimum, the following information will be recorded during the collection of each sample:

- Sample location and description
- Site sketch showing sample location and measured distances
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or grab
- Type of sample (i.e., matrix)
- Type of sampling equipment used
- Onsite measurement data (e.g., temperature, pH, conductivity, etc.)
- Field observations and details important to analysis or integrity of samples (e.g., heavy rains, odors, colors, etc.)
- Preliminary sample descriptions (e.g., for soils: clay loam, very wet; for

groundwater: clear water with strong ammonia-like odor)

- Type(s) of preservation used
- Instrument reading (e.g., OVM, HNU, etc.)
- Lot numbers of the sample containers, sample tag numbers, chain-of-custody form numbers, and chain-of-custody seal numbers
- Shipping arrangements (overnight air bill number)
- Recipient laboratory(ies)

In addition to the sampling information, the following specifics will also be recorded in the field logbook for each day of sampling:

- Team members and their responsibilities
- Time of site arrival/entry on site and time of site departure
- Other personnel on site
- A summary of any meetings or discussions with any potentially responsible parties (PRPs), representatives of PRPs, or federal, state, or other regulatory agencies
- Deviations from sampling plans, site safety plans, and QAPjP procedures
- Changes in personnel and responsibilities as well as reasons for the changes
- Levels of safety protection
- Calibration readings for any equipment used and equipment model and serial number.

## **7.2 Bottles and Preservatives**

The number of sample containers, volumes, and materials are listed in the Section 4.0, Request for Analyses tables. The containers are pre-cleaned and will not be rinsed prior to sample collection. Preservatives, if required, will be added by \_\_\_\_\_[Name of agency/organization doing sampling] to the containers prior to shipment of the sample containers to the laboratory.

### **7.2.1 Soil Samples**

Include this subsection if collecting soil samples. Otherwise delete.

If requested analyses include analyses other than volatile organic compounds or metals, include this paragraph; otherwise delete:

\_\_\_\_\_[Include all requested analysis(es), e.g., “CLPAS Pesticides/PCBs, CLPAS Semivolatile Organic Compounds”]. Soil samples will be homogenized and transferred from the sample-dedicated homogenization pail into 8-ounce, wide-mouth glass jars using a trowel. For each sample, one 8-ounce glass jar will be collected for each laboratory. The samples will be chilled to 4°C immediately upon collection.

If requested analyses include volatile organic compounds, include this paragraph; otherwise delete:

*CLPAS Volatile Organic Compounds.* Soil samples to be analyzed for CLPAS volatile organic compounds will be transferred directly from the sampling equipment into 120-milliliter (ml), wide-mouth glass vials using a trowel. For each

sample, two 120-ml glass vials will be collected for each laboratory. The samples will be chilled to 4°C immediately upon collection.

*If requested analyses include metals, include this paragraph; otherwise delete:*

*CLPAS Metals.* Soil samples to be analyzed for CLPAS metals will be homogenized and transferred from the sample-dedicated homogenization pail into 8-ounce, wide-mouth glass jars. For each sample, one 8-ounce glass jar will be collected for each laboratory. Samples do not need to be chilled.

### **7.2.2 Sediment Samples**

Include this subsection if collecting sediment samples. Otherwise delete.

If requested analyses include analyses other than volatile organic compounds or metals, include this paragraph; otherwise delete:

\_\_\_\_\_[Include all requested analysis(es), e.g., “CLPAS Pesticides/PCBs, CLPAS Semivolatile Organic Compounds”]. Sediment samples will be homogenized and transferred from the sample-dedicated homogenization pail into 8-ounce, wide-mouth glass jars. For each sample, one 8-ounce glass jar will be collected for each laboratory. The samples will be chilled to 4°C immediately upon collection.

*If requested analyses include volatile organic compounds, include this paragraph; otherwise delete:*

*CLPAS Volatile Organic Compounds.* Sediment samples to be analyzed for CLPAS volatile organic compounds will be transferred directly from the sampling equipment into 120-milliliter (ml), wide-mouth glass vials using a trowel. For each sample, two 120-ml glass vials will be collected for each laboratory. The samples will be chilled to 4°C immediately upon collection.

*If requested analyses include metals, include this paragraph; otherwise delete:*

*CLPAS Metals.* Sediment samples to be analyzed for CLPAS metals will be homogenized and transferred from the sample-dedicated homogenization pail into 8-ounce, wide-mouth glass jars. For each sample, one 8-ounce glass jar will be collected for each laboratory. Samples do not need to be chilled.

### **7.2.3 Groundwater Samples**

Include this subsection if collecting groundwater samples. Otherwise delete.

If requested analyses include analyses other than volatile organic compounds or metals, include this paragraph; otherwise delete:

\_\_\_\_\_[Include all requested analysis(es), e.g., “CLPAS Pesticides/PCBs, CLPAS Semivolatile Organic Compounds”]. Low concentration groundwater samples to be analyzed for \_\_\_\_\_[Include all requested analysis(es), e.g., “CLPAS Pesticides/PCBs, CLPAS Semivolatile Organic Compounds”] will be collected in 1-liter amber glass bottles. No preservative is required for these samples. The samples will be chilled to 4°C immediately upon collection. Two bottles of each groundwater sample are required for each laboratory.

If requested analyses include volatile organic compounds, include this paragraph; otherwise delete:

*CLPAS Volatile Organic Compounds.* Low concentration groundwater samples to be analyzed for CLPAS volatile organic compounds will be collected in 40-ml glass vials. 1:1 hydrochloric acid (HCl) will be added to the vial prior to sample collection. During purging, the pH will be measured using a pH meter on at least one vial at each sample location to ensure the pH is less than 2. The tested vial will be discarded. If the pH is greater than 2, additional HCl will be added to the sample vials. Another vial will be pH tested to ensure the pH is less than 2. The tested vial will be discarded. The vials will be filled so that no headspace occurs. The samples will be chilled to 4°C immediately upon collection. Three vials of each groundwater sample is required for each laboratory.

If requested analyses include metals, include this paragraph; otherwise delete:

*CLPAS Metals.* Low concentration groundwater samples collected for CLPAS metals analysis will be collected in 1-liter polyethylene bottles. The samples will be preserved by adding in nitric acid (HNO<sub>3</sub>) to the sample bottle. The bottle will be capped and lightly shaken to mix in the acid. A small quantity of sample will be poured into the bottle cap where the pH will be measured using pH meter. The pH must be less than or equal to 2. The sample in the cap will be discarded, and the pH of the sample will be adjusted further if necessary. The samples will be chilled to 4°C immediately upon collection. One bottle of each groundwater sample is required for each laboratory.

#### **7.2.4 Equipment Rinsate Blanks**

Include subsection 7.2.4 if equipment rinsate blanks are to be collected. Otherwise delete.

If requested analyses include analyses other than volatile organic compounds or metals, include this paragraph; otherwise delete:

\_\_\_\_\_[Include all requested analysis(es), e.g., “CLPAS Pesticides/PCBs, CLPAS Semivolatile Organic Compounds”]. Low concentration equipment rinsate blanks to be analyzed for \_\_\_\_\_[Include all requested analysis(es), e.g., “CLPAS Pesticides/PCBs, CLPAS Semivolatile Organic Compounds”] will be collected in 1-liter amber glass bottles. No preservative is required for these blanks. The blanks will be chilled to 4°C immediately upon collection. Two bottles of each equipment rinsate sample are required for each laboratory.

If requested analyses include volatile organic compounds, include this paragraph; otherwise delete:

*CLPAS Volatile Organic Compounds.* Low concentration equipment rinsate blanks to be analyzed for volatile organic compounds will be collected in 40-ml glass vials. 1:1 hydrochloric acid (HCl) will be added to the vial prior to sample collection. The pH will be measured using a pH meter on at least one vial at each sample location to ensure the pH is less than 2. The tested vial will be discarded. If the pH is greater than 2, additional HCl will be added to the sample vials. Another vial will be pH tested to ensure the pH is less than 2. The tested vial will be discarded. The vials will be filled so that no headspace occurs. The samples will be chilled to 4°C immediately upon collection. Three vials of each equipment rinsate blank are required for each laboratory.

*If requested analyses include metals, include this paragraph; otherwise delete:*

*CLPAS Metals.* Low concentration equipment rinsate blanks collected for total metals analysis will be collected in 1-liter polyethylene bottles. The blanks will be preserved by adding nitric acid (HNO<sub>3</sub>) to the sample bottle. The bottle will be capped and lightly shaken to mix in the acid. A small quantity of sample will be poured into the bottle cap where the pH will be measured using pH meter. The pH must be less than or equal to 2. The sample in the cap will be discarded, and the pH of the sample will be adjusted further if necessary. The samples will be chilled to 4°C immediately upon collection. One bottle of each equipment rinsate blank is required for each laboratory.

#### **7.2.5 Field Blanks**

Include subsection 7.2.5 if field blanks are to be collected. Otherwise delete.

If requested analyses include analyses other than volatile organic compounds or metals, include this paragraph; otherwise delete:

\_\_\_\_\_[Include all requested analysis(es), e.g., “CLPAS Pesticides/PCBs, CLPAS Semivolatile Organic Compounds”]. Low concentration field blanks to be analyzed for \_\_\_\_\_[Include all requested analysis(es), e.g., “CLPAS Pesticides/PCBs, CLPAS Semivolatile Organic Compounds”] will be collected in 1-liter amber glass bottles. No preservative is required for these blanks. The blanks will be chilled to 4°C immediately upon collection. Two bottles of each field sample are required for each laboratory.

If requested analyses include volatile organic compounds, include this paragraph; otherwise delete:



*CLPAS Volatile Organic Compounds.* Low concentration field blanks to be analyzed for volatile organic compounds will be collected in 40-ml glass vials. 1:1 hydrochloric acid (HCl) will be added to the vial prior to sample collection. The pH will be measured using a pH meter on at least one vial at each sample location to ensure the pH is less than 2. The tested vial will be discarded. If the pH is greater than 2, additional HCl will be added to the sample vials. Another vial will be pH tested to ensure the pH is less than 2. The tested vial will be discarded. The vials will be filled so that no headspace occurs. The samples will be chilled to 4°C immediately upon collection. Three vials of each field blank are required for each laboratory.

*If requested analyses include metals, include this paragraph; otherwise delete:*

*CLPAS Metals.* Low concentration field blanks collected for total metals analysis will be collected in 1-liter polyethylene bottles. The blanks will be preserved by adding nitric acid (HNO<sub>3</sub>) to the sample bottle. The bottle will be capped and lightly shaken to mix in the acid. A small quantity of sample will be poured into the bottle cap where the pH will be measured using pH meter. The pH must be less than or equal to 2. The sample in the cap will be discarded, and the pH of the sample will be adjusted further if necessary. The samples will be chilled to 4°C immediately upon collection. One bottle of each field blank is required for each laboratory.

### **7.2.6 Trip Blanks**

Include subsection 7.2.6 if trip blanks are to be collected. Otherwise delete.

*CLPAS Volatile Organic Compounds.* Low concentration trip blanks to be analyzed for volatile organic compounds will be collected in 40-ml glass vials. 1:1 hydrochloric acid (HCl) will be added to the vial prior to sample collection. The pH will be measured using a pH meter on at least one vial at each sample location to ensure the pH is less than 2. The tested vial will be discarded. If the pH is greater than 2, additional HCl will be added to the sample vials. Another vial will be pH tested to ensure the pH is less than 2. The tested vial will be discarded. The vials will be filled so that no headspace occurs. The samples will be chilled to 4°C immediately upon collection. Three vials of each trip blank are required for each laboratory.

### **7.3 Sample Traffic Report And Chain-Of-Custody Records, RAP Packing Lists, and QA/QC Summary Forms**

Organic and inorganic traffic reports and chain-of-custody records and RAP packing lists are used to document sample collection and shipment to laboratory for analysis. All sample shipments for CLPAS analyses will be accompanied by a traffic report and chain-of-custody record. All sample shipments for RAP analyses will be accompanied by a packing list. Form(s) will be completed and sent with the samples for each laboratory and each shipment (i.e., each day). If multiple coolers are sent to a single laboratory on a single day, form(s) will be completed and sent with the samples for each cooler.

The traffic report and chain-of-custody record or RAP packing list will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are shipped, the custody of the samples will be the responsibility of \_\_\_\_ [Name of agency/organization conducting sampling]. The site leader or designee will sign the traffic report and chain-of-custody record or RAP packing list. The site leader or designee will sign the "relinquished by" box and note date, time, and air bill number.

Include the following paragraph if requested analytical methods for this sampling event include CLPAS inorganic methods, otherwise delete:

For samples submitted for CLPAS inorganic analysis, the green (original) and pink (second) copies of the traffic report and chain-of-custody record will be sent to the EPA Region IX Quality Assurance Management Section (QAMS) and the white (third) and yellow (fourth) copies will accompany the samples to the laboratory. A copy of the original will be made for the \_\_\_\_ [Name of agency/organization conducting sampling] master files.

Include the following paragraph if requested analytical methods for this sampling event include CLPAS organic methods, otherwise delete:

For samples submitted for CLPAS organic analyses, the blue (original) and pink (second) copies of the traffic report and chain-of-custody record will be sent to the EPA Region IX Quality Assurance Management Section (QAMS) and the white (third) and yellow (fourth) copies will accompany the samples to the laboratory. A copy of the original will be made for the \_\_\_\_[Name of agency/organization conducting sampling] master files.

Include the following paragraph if requested analytical methods for this sampling event include RAP or RAP + CLPAS methods, otherwise delete:

The white (original) copy of the RAP packing list will be sent to the EPA Region IX Quality Assurance Management Section (QAMS), the yellow (second) copy will go to the Contact Laboratory Analytical Services Support (CLASS) office, and the gold (third) and pink (fourth) copies will accompany the samples to the laboratory. A copy of the original will be made for the \_\_\_\_[Name of agency/ organization conducting sampling] master files.

A quality assurance/quality control (QA/QC) summary form will be completed for each laboratory and each matrix of the sampling event. The sample numbers for all rinsate samples, reference samples, laboratory QC samples, and duplicates will be documented on this form (see Section 8.0). The original form will be sent to QAMS; a photocopy will be made for the \_\_\_\_[Name of agency/ organization conducting sampling] master files. This form is not sent to the laboratory.

A self-adhesive custody seal will be placed across the lid of each sample. For VOC samples, the seal will be wrapped around the cap. The shipping containers in which samples are stored (usually sturdy picnic cooler or ice chest) will be sealed with self-adhesive custody seals any time they are not in someone's possession or view before shipping. All custody seals will be signed and dated.

The CLP Paperwork Instructions, Appendix G to the guidelines on *Preparation of a U.S. EPA Region 9 Sample Plan for EPA-Lead Superfund Projects*, will be taken to the field as a reference. Corrections on sample paperwork will be made by placing a single line through the mistake and initialing and dating the change. The correct information will be entered

above, below, or after the mistake.

#### **7.4 Photographs**

Photographs will be taken at every sample location and at other areas of interest on site. They will serve to verify information entered in the field logbook. When a photograph is taken, the following information will be written in the logbook or will be recorded in a separate field photography log:

- Time, date, location, and, if appropriate, weather conditions
- Description of the subject photographed
- Name of person taking the photograph

#### **7.5 Labeling, Packaging, And Shipment**

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. The CLP samples will have preassigned, identifiable, and unique numbers. At a minimum, the sample labels will contain the following information: CLP Case or RAP Number, station location, date of collection, analytical parameter(s), and method of preservation. Every sample, including samples collected from a single location but going to separate laboratories, will be assigned a unique sample number.

All sample containers will be placed in a strong-outside shipping container (a steel-belted cooler). The following outlines the packaging procedures that will be followed for low concentration samples.

1. When ice is used, secure the drain plug of the cooler with fiberglass tape to prevent melting ice from leaking out of the cooler.
2. Line the bottom of the cooler with bubble wrap to prevent breakage during shipment.

3. Check screw caps for tightness and, if not full, mark the sample volume level of liquid samples on the outside of their sample bottles with indelible ink.
4. Secure bottle/container tops with clear tape and custody seal all container tops.
5. Affix sample labels onto the containers with clear tape.
6. Wrap all glass sample containers in bubble wrap to prevent breakage.
7. Seal all sample containers in heavy duty plastic bags. Write the sample numbers on the outside of the plastic bags with indelible ink.

All samples will be placed in coolers with the appropriate traffic report and chain-of-custody forms or RAP packing lists. All forms will be enclosed in a large plastic bag and affixed to the underside of the cooler lid. Empty space in the cooler will be filled with bubble wrap or styrofoam peanuts to prevent movement and breakage during shipment. Vermiculite will also be placed in the cooler to absorb spills if they occur. Ice used to cool samples will be double sealed in two zip lock plastic bags and placed on top and around the samples to chill them to the correct temperature. Each ice chest will be securely taped shut with nylon strapping tape, and custody seals will be affixed to the front, right and back of each cooler.

The EPA Region IX Regional Sample Control Center (RSCC) will be notified daily (phone 415-744-1498) of the sample shipment schedule (Friday shipments must be reported no later than noon) and will be provided with the following information:

- Sampling contractor's name
- The name and location of the site
- Case number or RAP number
- Total number(s) by concentration and matrix of samples shipped to each laboratory
- Carrier, air bill number(s), method of shipment (priority next day)
- Shipment date and when it should be received by lab
- Irregularities or anticipated problems associated with the samples
- Whether additional samples will be shipped or if this is the last shipment.

## **8.0 QUALITY CONTROL**

### **8.1 \_\_\_\_\_[Equipment Rinsate, Field, and/or Trip] Blanks**

This subsection describes equipment rinsate, field, and/or trip blanks to be collected during the sampling event. In general equipment, rinsate blanks will be collected when reusable, non-disposable sampling equipment (e.g., trowels, hand augers, and groundwater sampling bailers) are being used for the sampling event. Only one blank sample per matrix per day should be collected. If equipment rinsate blanks are collected, field blanks and trip blanks are not required under normal circumstances. Equipment rinsate blanks can be collected for soil, sediment, and water samples. A minimum of one equipment rinsate blank is prepared each day for each matrix when equipment is decontaminated in the field. Field blanks are collected when sampling water or air and equipment decontamination is not necessary or a sample collection vessel is not used (e.g., dedicated pumps). A minimum of one field blank is prepared each day sampling occurs in the field but equipment is not decontaminated. Trip blanks are required only if no other type of blank will be collected for volatile organic compound analysis and when air and/or water samples are being collected. If trip blanks are required, one is submitted to the laboratory for analysis with every shipment of samples for VOC analysis. These blanks are submitted "blind" to the laboratory, packaged like other samples and each with its own unique identification number.

*If equipment rinsate blanks are to be collected, include this paragraph:*

Equipment rinsate blanks will be prepared to evaluate field sampling and decontamination procedures. The equipment rinsate blanks will be prepared as described in Section 5. \_\_\_\_\_ [Check for subsection number from Section 5] and be analyzed for \_\_\_\_\_ [Include list of requested analyses]. A minimum of one equipment rinsate blank will be collected per matrix per day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing HPLC-grade water (for organics) and/or deionized water (for inorganics) through or over the decontaminated sampling device.

*If field blanks are to be collected, include this paragraph:*

Field blanks will be prepared to evaluate if contaminants have been introduced into the samples during the sampling procedures. Field blanks will be prepared as described in Section 5. \_\_\_\_\_ [Check for subsection number from Section 5] and be analyzed for \_\_\_\_\_ [Include list of requested analyses]. A minimum of one field blank will be collected per matrix per day that sampling occurs in the field but sampling equipment is not decontaminated. Field blanks will be obtained by pouring HPLC-grade water (for organics) and/or deionized water (for inorganics) into a sampling container at the sampling point.

*If trip blanks are to be collected, include this paragraph:*

Trip blanks will be prepared to evaluate if the shipping and handling procedures are introducing contaminants into the samples, and if cross contamination in the form of VOC migration has occurred between the collected samples. Trip blanks will be prepared as described in Section 5. \_\_\_\_\_ [Check for subsection number from Section 5] and be analyzed for \_\_\_\_\_ [Include list of requested analyses]. A minimum of one trip blank will be submitted to the laboratory for analysis with every shipment of samples for VOC analysis. Trip blanks are 40 ml vials that have been filled with HPLC-grade water and shipped with the empty sampling containers to the site prior to sampling. The sealed trip blanks are not opened in the field and are shipped to the laboratory in the same cooler with the samples collected for volatile analyses.

*Always include this paragraph:*

Blanks will be preserved, packaged, and sealed as appropriate for water samples. A separate CLP sample number and station number will be assigned to each blank, and it will be submitted blind to the laboratory.

## **8.2 Background (Reference) Samples**

The background (reference) samples will be collected in an area which is unlikely to have received contaminants. Background samples are intended to be representative of conditions that exist in the site vicinity. Background samples will be taken in similar geological strata to the other sample locations and at similar depth.

In the following paragraph, delete irrelevant sentences. If there are only one or two sentences in the resulting paragraph, it may be combined with the first paragraph.

Background soil samples will be obtained from sample locations \_\_\_\_\_ [Background soil sample locations]. Background sediment samples will be collected from sample locations \_\_\_\_\_ [Background sediment sample locations]. Background/upgradient groundwater samples will be collected from sample locations \_\_\_\_\_ [Background groundwater sample locations].

Background samples will be preserved, packaged, and sealed in the same manner as other samples of the same matrix. A separate CLP sample number and station number will be assigned to each background sample, and it will be submitted blind to the laboratory.

## **8.3 Duplicate Samples**

Duplicate samples are collected simultaneously with a standard sample from the same source under identical conditions

into separate sample containers. A duplicate sample is treated independently of its counterpart in order to assess laboratory performance through comparison of the results. At least 10 percent of samples collected per event will be duplicates. At least one duplicate will be collected for each sample matrix. Every analytical group for which a standard sample is analyzed will also be tested for in one or more duplicate samples. Duplicate samples should be collected from areas of known or suspected contamination.

*Include this paragraph if collecting soil samples:*

Duplicate soils samples will be collected at sample locations \_\_\_\_\_ [Soil sample locations which will be split for duplicate analysis]. Duplicate samples will be collected from these locations because \_\_\_\_\_ [add sentence(s) here explaining the rationale for collecting duplicate samples from these locations; i.e., samples from these locations are suspected to exhibit the highest concentrations of contaminants or previous sampling events have detected the highest levels of contamination at the site at these locations.]

*Include this paragraph if collecting soil samples and analyzing for volatiles and other compounds:*

As described in Sections 5.1 and 5.2, soil samples to be analyzed for \_\_\_\_\_ [List all analytical methods for this sample event except for volatiles] will be homogenized with a trowel in a sample-dedicated 1-gallon disposable pail. Homogenized material from the bucket will then be transferred to the appropriate wide-mouth glass jars for both the regular and duplicate samples. All jars designated for a particular analysis (e.g., CLPAS semivolatile organic compounds) will be filled sequentially before jars designated for another analysis are filled (e.g., CLPAS metals). Soil samples to be analyzed for RAS volatile organic compounds will not be homogenized. When collecting duplicate soil samples to be analyzed for RAS volatile organic compounds, equivalent portions of sample collected from the same boring will be transferred to both regular and duplicate sample containers.

*Include this paragraph if collecting soil samples and not analyzing for volatiles:*

As described in Sections 5.1 and 5.2, soil samples will be homogenized with a trowel in a sample-dedicated 1-gallon disposable pail. Homogenized material from the bucket will then be transferred to the appropriate wide-mouth glass jars for both the regular and duplicate samples. All jars designated for a particular analysis (e.g., CLPAS semivolatile organic compounds) will be filled sequentially before jars designated for another analysis are filled (e.g., CLPAS metals).

*Include this paragraph if collecting soil samples and analyzing only for volatiles:*

As described in Sections 5.1 and 5.2, soil samples will not be homogenized. When collecting duplicate soil samples to be analyzed for volatile organic compounds, equivalent portions of sample collected from the same boring will be transferred to both regular and duplicate sample containers.

Include these paragraphs if collecting surface water sediment samples. It is assumed that volatiles analysis will not be done for sediment samples. If volatiles analysis will be done for sediment samples, modify the above paragraph for soil sample volatile analyses by changing "soil" to "sediment".

Duplicate sediment samples will be collected at sample locations \_\_\_\_\_ [Sediment sample locations which will be split for duplicate analysis]. Duplicate samples will be collected from these locations because \_\_\_\_\_ [add sentence(s) here explaining the rationale for collecting duplicate samples from these locations; i.e., samples from these locations are suspected to exhibit the highest concentrations of contaminants or previous sampling events have detected the highest levels of contamination at the site at these locations.]

As described in Sections 5.1 and 5.2, sediment samples will be homogenized with a trowel in a sample-dedicated 1-gallon disposable pail. Homogenized material from the bucket will then be transferred to the appropriate wide-mouth glass jars for both the regular and duplicate samples. All jars designated for a particular analysis (e.g., CLPAS semivolatile organic compounds) will be filled sequentially before jars designated for another analysis are filled (e.g., CLPAS metals).

*Include this paragraph if collecting groundwater samples:*

Duplicate groundwater samples will be collected for groundwater sample numbers \_\_\_\_\_ [Groundwater sample

numbers which will be split for duplicate analysis]. Duplicate samples will be collected from these locations because \_\_\_\_\_[*add sentence(s) here explaining the rationale for collecting duplicate samples from these locations; i.e. samples from these locations are suspected to exhibit the highest concentrations of contaminants or previous sampling events have detected the highest levels of contamination at the site at these locations.*] When collecting duplicate groundwater samples, bottles with the two different sample identification numbers will alternate in the filling sequence (e.g., a typical filling sequence might be, CLPAS pesticides/PCBs designation GW-2, CLPAS pesticides/PCBs designation GW-4 (duplicate of GW-2); CLPAS metals, designation GW-2, CLPAS metals, designation GW-4, (duplicate of GW-2) etc.). Note that bottles for one type of analysis should be filled before bottles for the next analysis are filled. Volatiles should always be filled first.

*Always include this paragraph:*

Duplicate samples will be preserved, packaged, and sealed in the same manner as other samples of the same matrix. A separate CLP sample number and station number will be assigned to each duplicate, and it will be submitted blind to the laboratory.

#### **8.4 Laboratory Quality Control Samples**

Laboratory quality control (QC) samples are analyzed by the EPA contract as part of the CLP standard laboratory quality control protocols. The laboratory monitors the precision and accuracy of the results of their analytical procedures through analysis of QC samples. In part, laboratory QC samples consist of matrix spike samples and matrix spike duplicate samples. The term “matrix” refers to use of the actual media collected in the field (i.e., routine soil and water samples). Laboratory QC samples are an aliquot (subset) of the field sample. They are not a separate sample but a special designation of an existing sample. A routinely collected soil sample (a full 8-oz. sample jar or two 120-ml sample vials) contains sufficient volume for both routine sample analysis and additional laboratory QC analyses. However, for water samples, double volumes of samples are supplied to the laboratory for its use. Two sets of water sample containers are filled and all containers are labeled with a single sample number. The laboratory is alerted as to which sample is to be used for QC analysis by notation on the sample container label and the traffic report and chain-of-custody record or SAS packing list.

At a minimum, one laboratory QC sample is required per week or one per 20 samples (including blanks and duplicates), whichever is greater. If the sample event lasts longer than 1 week or involves collection of more than 20 samples per matrix, additional QC samples will be designated. For this sampling event, samples collected at the following locations will be the designated laboratory QC samples:

*If a matrix is not being sampled, delete the reference to that matrix:*

- For soil, samples \_\_\_\_\_[soil sample numbers designated for QA/QC]
- For sediments, samples \_\_\_\_\_[sediment sample numbers designated for QA/QC]
- For groundwater, samples \_\_\_\_\_[groundwater sample numbers designated for QA/QC]

Add a paragraph explaining why these sample numbers were chosen for QA/QC samples. QA/QC samples should be the samples from each matrix expected to demonstrate the highest levels of contamination. The rationale should justify the selection of QA/QC samples based on previously-detected contamination at the site, historic site operations, expected contaminant deposition/ migration, etc.

#### **8.5 Temperature Blanks**

One temperature blank consisting of a 40-milliliter glass vial of distilled water shall be included in each cooler shipped to the analytical laboratory. The purpose of the temperature blank is to allow the analytical laboratory to obtain a representative measurement of the temperature of samples enclosed in a cooler without disturbing the actual samples. The field team will package and label the temperature blank like a regular water sample, however the analytical laboratory will only measure the temperature of the blank. The temperature blank will not be analyzed for hazardous substances.

## **8.6 Field Variances**

As conditions in the field may vary, it may become necessary to implement minor modifications to sampling as presented in this plan. When appropriate, QAMS will be notified of the modifications and a verbal approval will be obtained before implementing the modifications. Modifications to the approved plan will be documented in the SI Report.

## Appendix A

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.



**APPENDIX B**  
**SAFETY AND HEALTH PLAN**  
**for**  
**SITE INSPECTION ACTIVITIES**  
**at the**  
**[Site Name]**  
**[City], [State]**

**EPA CONTRACT NUMBER 68-W9-0060**

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**U.S. Environmental Protection Agency  
Hazardous Waste Management Division  
Field Operations Branch  
75 Hawthorne Street  
San Francisco, CA 94105**

**Prepared by:**

**Bechtel Environmental, Inc.  
45 Fremont Street  
San Francisco, CA 94105**

**APPROVED:**  
**Safety and Health Services Manager**

**APPROVED:**  
**Project Manager**

## **Attachment A**

### **Additional Methods and Procedures**

*This attachment contains generic procedures for collecting surface water samples, conducting well inspections, developing wells, conducting slug tests, sampling groundwater springs, and surveying onsite wells. If one of these field procedures is appropriate for the site investigation, it should be incorporated in Section 5.0 of the FSP in the appropriate location with any necessary site-specific modifications. Subsections should then be renumbered accordingly. This attachment should not be submitted to the EPA as part of the FSP.*

#### **5.X Surface Water Samples**

Surface water samples will be collected as grab samples (independent, discrete samples). Surface water samples will be collected from the center of the surface water body using a clean 5-gallon sampling bucket. The sampler shall wade into the water downstream of the sampling point and slowly wade upstream to the sampling point. The sampler shall wait for the current to flush and clear the water thoroughly before sampling. The surface water sample will be collected by dipping the sampling bucket into the water in the upstream direction. Extreme care will be taken to prevent disturbing the sediments on the stream bottom and including them as part of the sample. When the sampling bucket is filled, surface water samples to be analyzed for \_\_\_\_\_ [analytical method(s) for which samples will be analyzed, e.g., CLPAS metals] will be transferred from the sampling bucket into the appropriate sample containers with preservative and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the sampling bucket to the sample container.

At each sampling location, all bottles designated for a particular analysis (e.g., CLPAS metals) will be filled sequentially before bottles designated for the next analysis are filled (e.g., CLPAS pesticides/PCBs). If a duplicate sample is to be collected at this location, all bottles designated for a particular analysis for both sample designations will be filled sequentially before bottles for another analysis are filled. In the filling sequence for duplicate samples, bottles with the two different sample designations will alternate (e.g., CLPAS metals designation SW-5, CLPAS metals designation SW-19 (duplicate of SW-5), CLPAS metals designation SW-5, etc.)

#### **5.X Groundwater Samples**

*Included in this subsection are general procedures for additional groundwater sampling activities including well inspections, well development, slug tests, and groundwater spring sampling. If such activities are to be included in the sampling event, these descriptions can be modified to reflect site-specific conditions and included with other groundwater sampling activities in Section 5.0.*

##### **5.X.1 Well Inspections.**

*Include this paragraph for monitoring well inspection:*

All monitoring wells will be inspected for integrity and upgraded for additional protection, if necessary. Well inspection will include verifying the presence of suitable locking devices for protection from unauthorized access. Protection from vandalism and vehicle traffic will also be considered when inspecting wells. Aboveground riser casings, caps, and grout aprons will be inspected for damage. Permanent well identification markings will be noted and, if absent, installed. Permanent identification (ID) markings should include the well designation, total well depth, well elevation using the National Geodetic Vertical Datum (NGVD) and reference point (top of casing, top of box, or ground surface). The well ID should be installed in a manner where the information is easily read and cannot be removed from the well. Usually this is done by etching or painting this information onto a metal tag and installing the tag on the well cap or attaching the tag to the casing in some other manner. Painting this information on the outside of the well casing or inside the protective cover is acceptable but not recommended because paint chemicals may induce spurious results in subsequent groundwater quality analyses. If painting is the chosen method, it should be done after the well has been sampled and closed. If the well is to be surveyed; survey points on well casing, well box, or grout apron will be permanently marked by etching the grout or notching the casing in a conspicuous manner. Surface well seals will be inspected for integrity, local surface spills, and proper drainage away from the well. Casings will be inspected at the surface for cracks or other damage.

*Include this paragraph for supply well inspection:*

Supply wells at the site will be inspected for integrity and usefulness as potential monitoring points. All wellhead fittings will be inspected and repaired, as necessary. Sampling ports, access ports, riser casing, and surface seal integrity will be inspected. Pumps and other equipment will be described as to type, general condition, and tested.

*Include this paragraph for all well inspections.*

Field notes for the well inspection should address the above points and include any other pertinent observations made regarding general construction of the well and siting of the wells relative to potential site hazards. Notes should describe all well locations based on permanent landmarks. Field notes should be kept in accordance with Section 7.1.

### **5.X.2 Well Development.**

*This subsection provides a description of well development of existing wells using the hand-held surge-block method. In general, this method is appropriate for relatively shallow, small-diameter wells in fine-grained or poorly-sorted (well-graded) unconsolidated formations. Depending upon site-specific conditions, other well development methods such as pumping or mechanical surging might be more appropriate.*

Existing groundwater wells \_\_\_\_\_[provide names of wells to be developed; e.g. monitoring wells B-1 and B-2] will be developed using the surge-block method. The surge-block technique is preferred for well development in fine-grained or poorly-sorted (well-graded) unconsolidated formations because the technique uses a “two-way” water flow through the filter pack sand, removing fine-grained particles which may inhibit well yield. Surge-block techniques also may remedy potential bridging problems which may have arisen during filter pack installation, nor do these techniques introduce any materials (air or tap water) into the saturated zone which may cause changes in aqueous geochemical conditions.

The surge-block well development will be performed as follows:

1. A weighted stainless-steel surge-block or “swab” attached to a rigid pipe or a line will be lowered into the upper two feet of the well screen. A surge-block is cylindrical, with a diameter approximately 0.2 inches less than the inside diameter of the well casing and screen. Water can flow between the block plate and well screen, relieving excess pressure to prevent collapse of the well screen. The surge-block is used to gently agitate the water by moving the swab in a continuous up and down motion. After the several up and down cycles, a more vigorous motion can be used to agitate the water.
2. After 5-10 minutes of swabbing, the block plate is removed from the well and groundwater can be bailed or pumped from the well. Because the well casing is 2-inch diameter PVC, casing storage volumes are sufficiently low that bailing will be effective in removing solids suspended during development. Additional agitation caused by bailing will further develop the well. If Wells B-1 and B-5 (deeper wells) recharge rapidly, an airlift pump may be needed to remove suspended silt from the wells.
3. After swabbing and bailing, the next two-foot section of the saturated well screen will be swabbed. The surge-block is lowered two more feet into the well intake and steps 1 and 2 are repeated. Ideally, at least ten casing volumes of water will be produced from each well during development. All groundwater produced during development will be stored in sealed and appropriately labeled 55-gallon drums prior to disposal.

*NOTE: A description of how well development water will be disposed will need to be added to Section 6.0.*

4. All sounding and developing equipment will be decontaminated immediately after use in each well to avoid cross-contaminating wells. Decontamination procedures are outlined in detail in Section 5.\_\_\_\_\_.

Well development should proceed until the wells yield water which is low enough in suspended solid content for sampling purposes. Turbidity will be checked visually during development. A field turbidity meter will be used during sampling. Silt buildup will be removed from all wells, if present. Surge-block techniques should be sufficient to suspend silt at the bottom of the

well screens for removal. Total well depth measurements will be made during well development to ascertain progress in removing any silt buildup which may be present in the well intake.

During development, indirect observations of the casing will be made by noting the silt and sand production, the degree of silt buildup in the well intake, the presence of scale or other encrusting material during bailing, and the ease of movement of the surge-block. A properly sized and weighted surge-block should drop down the well without sticking or getting caught on the sides of the casing or intake. Difficulties encountered during insertion of the surge-block may indicate damage to the casing or improper installation.

Samples will not be collected from wells until at least 24 hours after development.

*Wells should be developed in order of increasing known or suspected contamination. A paragraph provide an order for well development and a rationale for this sequence should be included here.*

**EXAMPLE:**

**Wells will be developed in order of increasing suspected contamination. Based on previously-detected groundwater contamination and historic practices at the site, monitoring wells will be developed in this order: B-4, B-2, B-1, and B-3. B-4 is upgradient of areas of suspected contamination, B-3 is immediately downgradient of areas of suspected contamination, and B-1 and B-2 are further downgradient.**

Field logbooks will be maintained for the development of each well in accordance with Section 7.1.

**5.X.3 Slug Tests.** Slug tests will be done in \_\_\_\_\_[well name(s)] which are located \_\_\_\_\_[provide well location(s)]. \_\_\_\_\_[name of first well] is screened in \_\_\_\_\_[name of geologic unit in which first well is screened] and \_\_\_\_\_[name of second well] is screened in \_\_\_\_\_[name of geologic unit in which second well is screened]. A slug test involves the instantaneous injection or withdrawal of a slug (a solid cylinder of known volume) or a known volume of water from a well and subsequent measurement of the artificial fluctuation of the water-level in the well. Slug test results can be used to estimate the horizontal hydraulic conductivity of distinct geologic horizons under in situ conditions.

To minimize the effects of disturbance of the aquifer on slug test results, slug tests will be performed before sampling. An electronic data-logger and pressure transducer will be used to record water level measurements during the slug test. All data will be recorded manually, stored electronically and printed out in the field. The following procedures will be used to conduct the slug test:

1. Decontaminate the pressure transducer and transducer cable;
2. Record required information into electronic data-logger (consult the operator's manual for the required information);
3. Determine the static water level in the well by measuring the depth to water periodically for several minutes and then taking the average of the readings;
4. Cover sharp edges of the well casing to protect the transducer cables;
5. Install the transducer and cable in the well to a depth below the drawdown estimated for the test but at least 2 feet from the bottom of the well. Additionally, the depth of submergence will be within the design range stamped on the transducer. Temporarily tape the transducer cable to the well to keep the transducer at a constant depth;
6. Connect the transducer cable to the electronic data-logger;
7. Enter the initial water level and transducer design range into the recording device according to the manufacturer's instructions. The transducer design range will be stamped on the side of the transducer. Record the initial water level on the recording device;
8. "Instantaneously" introduce the slug or a known volume of water to the well. It is important

to add the volume as quickly as possible because the analysis assumes that an “instantaneous” change in volume is created in the well;

9. Consider the moment of volume addition as time zero. It is critical to make as many measurements as possible in the early part of the test. Depth to water should be measured to the nearest 0.01 foot and time to the nearest 0.1 second. In addition to measurements recorded in the electronic data logger, time and depth measurements should also be recorded manually in a log book;
10. Continue recording depth-time measurements until the water level returns to equilibrium conditions or a sufficient number of readings have been made to clearly show a trend on a semilogarithmic plot of time versus depth. This period of time could range anywhere from a few minutes to a few hours;
11. Stop electronic logging sequence;
12. Print slug test data from the electronic data logger;
13. Save logger memory and disconnect battery;
14. Remove transducer from well and decontaminate equipment using procedures outlined in Section 5.6;
15. Review field forms and logbook for completeness; and
16. Steps 1-15 will be repeated to test each well a second time in order to be able to compare the results of two different slug tests for each well.

Field logbooks will be maintained for the slug test in accordance with Section 7.1.

**5.X.4 Spring Samples.** Groundwater samples will be collected from four natural springs that are used as sources of drinking water (\_\_\_\_\_[sampling numbers for groundwater spring samples]). Groundwater spring samples will be collected using a peristaltic pump and clean flexible Teflon tubes. All tubes will be decontaminated before and after use in each spring. Natural springs do not need to be purged prior to sampling. Clean Teflon tubing will be placed into the spring, and water will be extracted using a peristaltic pump. Care will be taken to prevent disturbing the sediments in the spring and including them as part of the sample. Groundwater samples to be analyzed for \_\_\_\_\_[analytical methods for which samples will be analyzed, e.g., CLPAS metals] will be transferred from the Teflon tubing directly into the appropriate sample containers with preservative and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the Teflon tubing to the sample container.

*Include this paragraph if samples are to be filtered, depending upon turbidity:*

Prior to collecting groundwater samples from the \_\_\_\_\_[number of springs to be sampled] natural springs, the turbidity of the water extracted from each spring will be measured using a portable turbidity meter. A column of water will be collected from the spring using a peristaltic pump. A small amount of water will be transferred to a disposable vial and a turbidity measurement will be taken and results will be recorded in the field logbook. The volume of water used to measure turbidity will be discarded after use. If the turbidity of the water in the spring is above 5 NTUs, samples will consist of both a filtered and unfiltered sample. A 5-micron filter will be used to remove larger particles that have been entrained in the water sample. A filter will be attached to the outlet of the Teflon tube. A clean unused filter will be used for each filtered sample collected. Samples will be transferred from the filter directly into the appropriate sample containers with preservative and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the filter to the sample container. After the filtered sample has been collected, the filter will be removed and an unfiltered sample will be collected.

## **5.X Survey of Onsite Wells and Surface Water Bodies**

**5.X.1 Groundwater Well Survey.** Well casing elevations will be surveyed for elevation to the nearest 0.01 foot using the National Geodetic Vertical Datum (NGVD) and for northings and eastings to the nearest 0.1 foot using the US Coast and Geodetic

Survey (USC&GS) datum and Universal Transverse Mercator System (UTM). The point on the well casing used for surveying will be permanently etched or notched into the rim of the casing.

A California [or other appropriate state] Licensed surveyor will be retained to survey all wells.

**5.X.2 Survey of Surface Water Elevations.** \_\_\_\_\_[Name of water body to be surveyed] elevations will be surveyed at \_\_\_\_\_[Number of survey points] points. These points will be surveyed for elevation to the nearest 0.01 foot, using the NGVD and for northings and eastings to the nearest 0.1 foot using USC&GS datum and UTM. Survey points should be located in standing water in order to relate water levels in the \_\_\_\_\_[river/stream/creek/slough/lake] to local hydrogeology. Survey points will be marked with a standpipe driven into the substrate or other suitable marker and appropriately labeled for future data collection. The survey points in \_\_\_\_\_[Name of Surface Water Body] will be designated, from upstream to downstream, \_\_\_\_\_[Sampling Point Designations].

Water-level readings will be collected by measuring the distance between the surveyed elevation point on the standpipe and the water level in the \_\_\_\_\_[river/stream/creek/slough/lake] with a graduated metal or Teflon tape measure to the nearest 0.01 foot.

A California Licensed [or other appropriate state] surveyor will be retained to survey \_\_\_\_\_[Name of water body to be surveyed].